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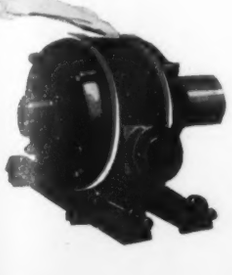
Red Bands *in* Industry



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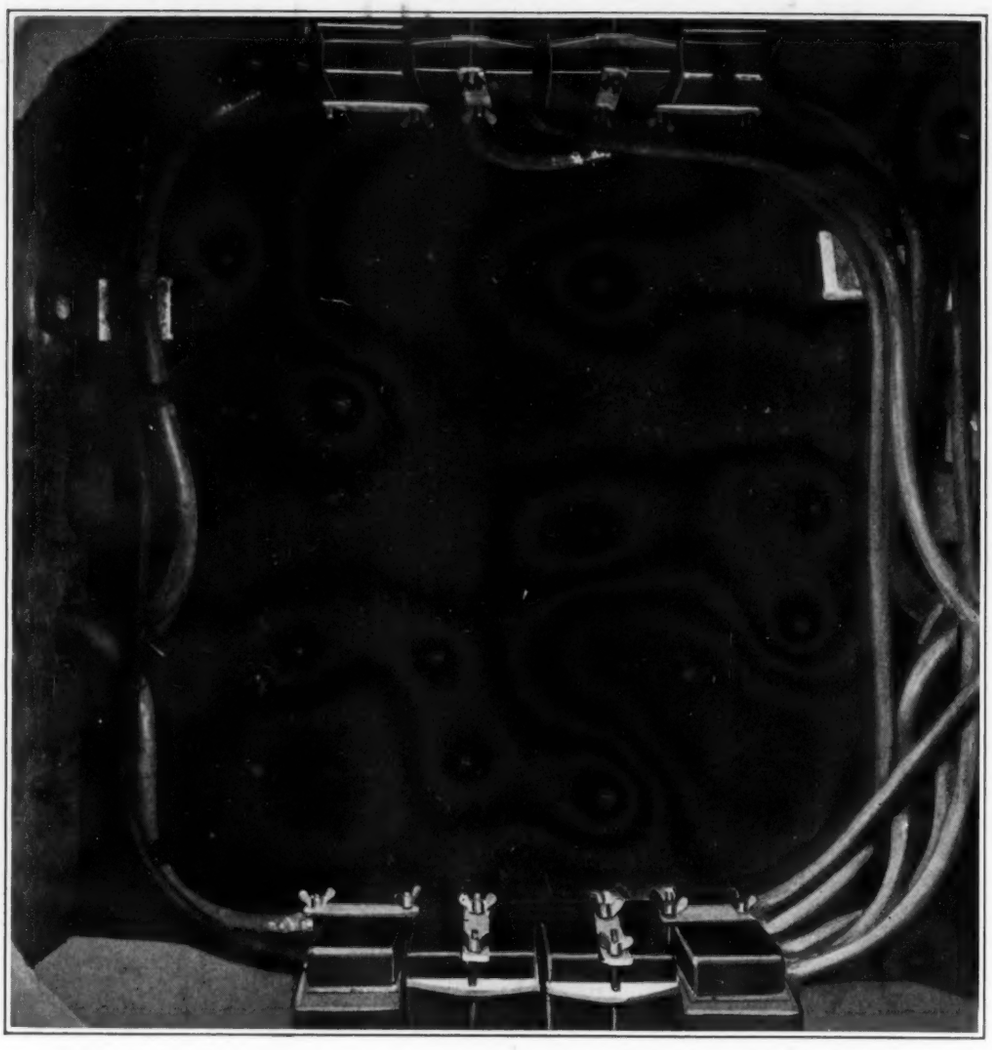

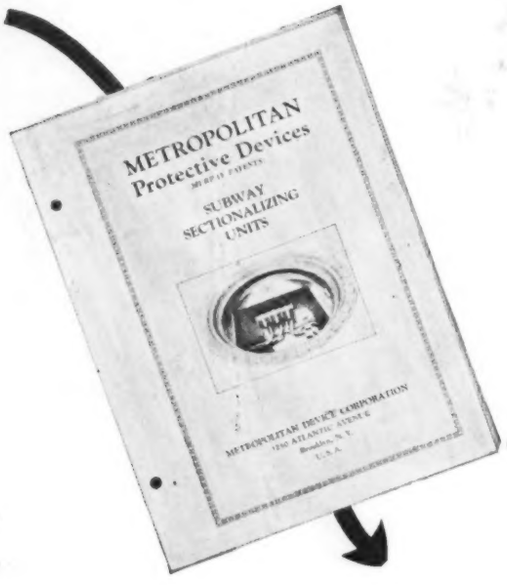

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Demonstrate the Lighting, Not the Equipment

SELL electric service and not the kilowatt-hour! Sell the lighting and not the fixture! These admonitions are becoming more and more recognized as typical of the spirit that should be behind the commercial department —and also the public relations efforts—of central-station companies today. Yet it is frequently difficult to get good examples of ways in which these precepts may be followed.

One of the most effective exhibits or arrangements which have yet been prepared for selling the effect of lighting, for demonstrating the various effects of different arrangements, for showing comparisons between good and bad, was the exhibit at the recent convention of the N. E. L. A. at Atlantic City prepared by the Lighting Bureau of that association's Commercial Section (W. T. Blackwell chairman) and the committee of the lamp manufacturing companies (S. G. Hibben Chairman), which co-operated with the former. Photographs of parts of this exhibit were reproduced on page 1042 of the ELECTRICAL WORLD, issue of May 24, but these could at best be mere indications of what the exhibit actually was in fact. The striking comparison between the old-style kitchen with its ineffective combination bracket and the modern kitchen, full of electrical conveniences and correctly illuminated with one of the latest developments of the lighting art, was particularly effective. Remarks made by visitors as they passed through the living room and library, with their excellent demonstration of various lighting effects, showed what interest could be aroused by a really worth-while arrangement to show lighting.

Emphasis is laid at this time on this exhibit—before it becomes too vague a memory—to urge upon central-station lighting bureaus, and any one else selling lighting equipment, that they study this and other good arrangements to sell lighting and not equipment. They all pay in better satisfied customers and in better business.

Should Engineers Help Sell Apparatus?

THIS is not foolish question No. 1111, series of 1924, even if the answer is so obvious as to lead the progressive reader to condemn the publication of such an inquiry. Its asking was prompted by the attitude of a competent designing specialist at a recent convention toward a possible sale of the equipment which he had described within a quarter hour to a large and interested audience of technical men. One of these, after the discussion, modestly suggested to the speaker a specific field of application, with the name and address of the "prospect"; but the designer's indifference was so painfully evident that the conversation became *spurlos versenkt*—sunk without trace of a tip in the designer's notebook and without the slightest sign of acknowledgment. Of course, this was a case of poor manners and as such could be passed over without comment were it not an index of a sort of "holier-than-thou" pose once in a while assumed by some technical specialists on parade before their sales brethren.

The incident would not deserve mention were it not always justifiable to reiterate the interdependence of engineering and sales staffs in successful organizations. More and more individuals combine technical and commercial duties in their daily activities, and thousands of engineers selling service embodied in apparatus forced to meet the keenest competition and designed by other engineers alert to co-operate in every possible way with the commercial members of their business families refute the singular notion that air-tight compartments can be maintained any longer between salesmen and designers. It may not be advisable for an expert designing engineer to go into the field and battle for orders in manufacturing or operating companies of resourceful organization, but no engineer worthy of his calling will "pass by on the other side" in the face of clearly defined opportunities to co-operate in the extension of his company's service.

Are Physicists Co-operating with the Industry More Actively than Professors?

IF THE man on the street were asked how discoveries in physical sciences are made to serve human needs, say, through electrical apparatus, he would probably "venture a guess" that unnamed inventors and college professors make discoveries and then big companies use these discoveries. As a matter of fact, the tendency in our industry has unmistakably been away from such a state of affairs and toward an integration of mental as well as of physical resources. Just as large manufacturing companies have found it to be to their advantage to control sources of their principal raw supplies and transportation, so they also have found it indispensable to employ physicists, chemists and inventors of the highest rank, to be assured of "private wires" from nature's own laboratory. Of late the names of the leading industrial scientists have become as widely known as those of productive scholars connected with institutions of learning.

The titles of subjects and the character of employment of the authors of the papers presented at the recent meeting of the American Physical Society in Washington are rather illuminating from the point of view of this changing character of the relation between pure and applied science. Out of the seventy-seven papers presented, 68 per cent were by teachers and by research fellows, 20 per cent by scientists connected with commercial concerns, and the remaining 12 per cent emanated from government bureaus and other non-commercial organizations. Even apart from mere statistics, the nature of the papers shows a very close co-operation between the departments of physics

in universities and the research departments of the electric manufacturing companies. Practically identical topics are treated by both, and one could hardly find a confirmation for the old belief that physical laws are discovered by college professors and then handed over to practical men for application. This present harmonious state of affairs should be very encouraging to both groups of scientists, and, in providing a direct channel for practical uses of new discoveries, it is certainly ideal from the point of view of humanity at large.

Those versed in the affairs of the American Institute of Electrical Engineers will find no such marked parallel connection between professors of electrical engineering and practicing engineers. It seems that in this country, with a few exceptions, teachers of electrical engineering have been forced by external circumstances —or have voluntarily agreed—to limit their activities to teaching undergraduates and to supervising the work of a few advanced students. This, of course, is also a necessary activity in the industry, and the high standards, both mental and moral, of our young electrical engineers are a glowing tribute to the teaching profession. The questions here raised and which deserve comment are these: What are the reasons why the sum total of the original contributions by our professors of electrical engineering to methods useful in the industry is not greater than it is? and, Why is it that the voluntary co-operation between professors of engineering and their practicing confrères is not nearly so close or pronounced as between the teaching and practicing physicists?

A Single-Unit, 110,000-Volt Insulator Proposed

ANYTHING that is new is rightly received with conservatism by engineers, particularly as regards its immediate and complete adoption in lieu of the older—and perhaps less efficient—equipment or methods which have already established themselves after trial in the fire of practical service experience. But all new developments deserve and receive hearty and cordial encouragement as possible better or cheaper tools to advance the electrical art. In particular do engineers appreciate a rational and analytical attack on a problem which results in a technical solution that is new and soundly derived, and they honor those of their associates who possess the ability to originate new and promising things for the benefit of the art.

What many engineers regard as an epoch-making contribution to the art of transmission was announced at the A. I. E. E. convention in Worcester last week by Prof. H. B. Smith and is described in this issue. As a result of a long period of development, he described and exhibited a new type of insulator proposed for high-tension systems provided that field-service tests give results corresponding to laboratory tests. In other words, a beautiful piece of engineering research came to fruition with a finished product embracing tremendous potentialities whose realization must await the results of an apprenticeship under service conditions.

The striking character of the insulator lies in its use of metal and wood, its design for operating at 110,000 volts per unit, its close ratio of wet and dry breakdown values and its conformation to utilize field effects to a maximum degree. From a technical standpoint it is fundamentally sound; its questionable features are those associated with service conditions. The tendency for wood to carbonize has prohibited its use in the past, for any initial carbonization originating from leakage or static tends to continue and spread. Professor Smith claims that the perfection of impregnation processes and the rational design used will prevent any carbonization in the proposed insulator. In addition, the insulator possesses possibilities in maintenance that may economically permit of stick replacements at intervals. Other features of the insulator in actual operation, such as ionization effects, the influence on it of bird excretions, bullet holes, hail, sleet, rain and snow, can be determined only by further researches. Until these are completed in practice, applications of the new insulator will be slow. But all the industry will in any event pay honor to the college professor and his associates, who have made a very promising contribution to the art.

Are the Central Stations Taking Their Increase in Business Too Much for Granted?

IT IS something of a shock to realize, as shown by W. M. Carpenter's analysis on page 1232, that the average domestic and commercial lighting customer in the State of New York, outside of the metropolitan district, actually used less energy during 1923 than he did in 1910. On the one hand, this is easily explained by the vast number of new customers and the higher efficiency of electric lamps. The improvement in the latter may be taken as an indication of the unselfish spirit of the electrical industry in passing on the benefit of new developments in the art. On the other hand, the fact that the central-station companies have not been able to keep the small customer's consumption up to where it was thirteen years ago does not speak so well for their commercial acumen.

New business, particularly in the form of new customers, has come to the central stations so fast that, with their inadequate commercial forces, they have not been able to develop the individual consumer. Combined, the additional power load and the new customers have increased energy sales in a most satisfactory manner—perhaps almost too satisfactory, for there appears to be a colored gentleman in the woodpile.

Statistics in New York State show that 12½ per cent of the energy sold accounts for 50 per cent of the gross revenue, which means that one-half of the income is from the small customers, that is, retail business. Putting it the other way, 87½ per cent of the energy is sold to power users and at comparatively low wholesale rates. This has materially reduced the cost per kilowatt-hour generated and resulted in a general lowering of rates for all customers. However, this is possible only so long as business is good and industries continue to use large quantities of energy. Should there be a serious slump and should power sales drop off sharply, then the unit cost of energy must naturally rise and the central-station companies would be dependent upon their sales to the small customers for a much larger proportion of their gross revenue and also of their profit. Are there enough of these customers to meet such a condition, if their low individual use of energy is allowed to continue? Might the failure to develop the small users necessitate an increase in their rates in the event of an extreme loss of industrial power sales?

In 1920 public utilities had an experience in a tight money market when they learned the fallacy of depend-

ing upon the sale of mortgage bonds without a sufficient equity built up by junior financing. Many of them then had to sell preferred stock to get money for new construction—one good result, of course, being to bring home the real value of customer ownership. In many respects conditions as represented by the large power load and the multitude of small customers are similar to the financial situation four years ago. It would seem better and safer, therefore, if central-station companies began now, before they feel the pinch of necessity, to concentrate their efforts on building up the load of the small customer instead of complacently waiting until the emergency is upon them.

Pictures of High-Voltage Transients

THE deep obscurity which surrounds that class of phenomena in transmission lines commonly spoken of as "transients" is entirely due to their brief duration in time. It is distressingly plain from their effects that in most cases they consist of high-voltage pulses or oscillations, and load changes, lightning effects and short circuits offer clear explanations of the general character of their origin and nature. But this is about all we have to guide us in making our preparations to handle them. So far no satisfactory method for studying these rapid pulses has been devised. Consequently such questions as the magnitude and character of the pulse as related to its origin, its range in frequency and wave front, the life of the pulse as it passes down the line, the nature of the protective equipment best suited for different types, and others of similar nature, have remained unanswered.

The problem is to find a device that will follow and also record these phenomena, which are completed within millionths or billionths of a second and are therefore quite beyond our perception, if not our imagination. Conceivably the cathode stream might follow faithfully the variation of such a pulse or oscillation, but no means are at hand for recording such possible variations within intervals so discouragingly brief.

A real step of progress to further knowledge of the elusive transient is apparently open in the possibilities of the "klydonograph," an instrument developed by J. F. Peters, for field application of a long-known phenomenon and recently described in the ELECTRICAL WORLD. The electric discharge from a terminal on a photographic plate over the surface of the latter is known not only to affect the plate, but the resulting figures have geometric dimensions proportional to the voltage causing the discharge. In other words, the discharge has actinic properties, and their measurable space diffusion over the surface of the plate appears to be a simple function of the maximum voltage. Moreover, the figures left on the plate have different forms characteristic of the polarity and the steepness of the voltage pulse. Thus the time of duration of the voltage is reflected in the degree of concentration of the effect on the plate. That is to say, under the direct influence of electric discharge the speed of response of the emulsion of the plate is just about right for the yielding of measurable space figures during the brief time intervals pertaining to transients. The instrument is far from ideal, particularly in that the steepness of pulse is apparently only indicated qualitatively. On the other hand, even if it offered no other feature than the measurement of the maximum value of a pulse, it would still be far in advance of other available means of study. So far, apparently, it has been used only in laboratory studies; its use in skilled hands to determine the behavior of power lines will be awaited with great interest throughout the industry.

Metropolitan Steam Stations Should Be Self-Starting

THE supply of power to auxiliaries in large power stations is a vital element in station design and no permanent or general solution to the problem has been found. A few years has witnessed a transition from all-steam auxiliaries to all-electric auxiliaries with innumerable modifications of arrangement in individual stations. The house turbine, duplex unit, heat-balance unit, steam extraction from main units, main-unit direct connection to auxiliary generator, main-bus auxiliary power supply and a multitude of duplications and reserves can be found in this or that existing station which gives fairly satisfactory operation under normal conditions.

But recently there has developed a tendency to think that station designers have gone to such extreme limits to obtain the last B.t.u. from the fuel that the element of reliable and continuous operation has been subordinated. It is agreed that whether this or that scheme for auxiliary service is used makes a possible difference in economy of only 2 per cent, and this should not be permitted to obscure the major purpose of the station—to give continuous and satisfactory service. This kind of reasoning has been stimulated by difficulties encountered on several properties in getting stations in service after the system load has been lost because of trouble. In some cases one or two hours has elapsed before conditions have become normal, and the largest part of the delay has arisen because the stations were not self-starting.

Thus it is now considered essential to make a large metropolitan station self-starting; that is, it should be able to come to voltage without having any power supplied from outside sources. Needless to say, this opens up a new field of development, and schemes are proposed ranging from the daring ones of using Diesel engines or storage batteries to ultra-conservative ones using all-steam auxiliaries. A storage-battery, Diesel-engine set or even a normally inactive house turbo-generator set could be installed to operate the auxiliaries of any unit during starting, provided that the unit type of installation were used, and then the normal auxiliary power supply would come into service. Moreover, it is practicable, although difficult to visualize, to install small high-pressure and high-temperature steam auxiliary drives throughout the station. But some compromise between these extremes will be used in ordinary cases because both operating and economic conditions lead to such a solution. Some auxiliaries, such as fans on the boilers, should stop when the main bus load is dropped; others should continue to operate; also, some auxiliaries may be direct-current and others alternating-current. For this reason the design should develop along lines which will give stations ready starting facilities and normal operating economies and yet retain the many operating advantages of electric drive for almost all auxiliaries under both normal and abnormal conditions.

It should be necessary only to install a crank or a self-starter on the existing engine.

Better Lighting Quickens Production in the Granite Industry

AS A result of an investigation begun not long since under the direction of W. S. Wallace, illuminating engineer for Charles H. Tenney & Company, Boston, managers of the Montpelier & Barre Light & Power Company, a notable beginning has been made in improving the lighting conditions in representative granite sheds. Experience already gained shows that if a minimum of fifty days per year is taken as the total during which stonecutting must be stopped in the sheds because of dull weather and inadequate interior lighting, an annual saving in wages of about $50 per employee can be realized by an investment of only $7.50 per man in suitable lighting equipment.

Fig. 1 is a view in the stonecutting shed of the Cook & Watkins Manufacturing Company at Barre. An intensity of about 7 foot-candles is obtained at the ground.

In Fig. 2 a more distant view is shown, giving an idea of the excellent diffusion obtained.

Figs. 3 and 4 show a prior installation and the one now existing in the stonecutting sheds of Marr & Gordon, also of Barre. Seventy-two 500 watt RLM daylight bowl units meet the requirements of the cutting shed, giving about 8 foot-candles on the ground.

Electrical Transmission of Pictures

Combination of High-Frequency Carrier Current, Vacuum-Tube Modulation, Telegraphic Synchronizing Equipment, Light-Controlled Electron Stream and Newly Developed "Light" Cell Makes Possible Long-Sought Electrical Transmission of Photographs

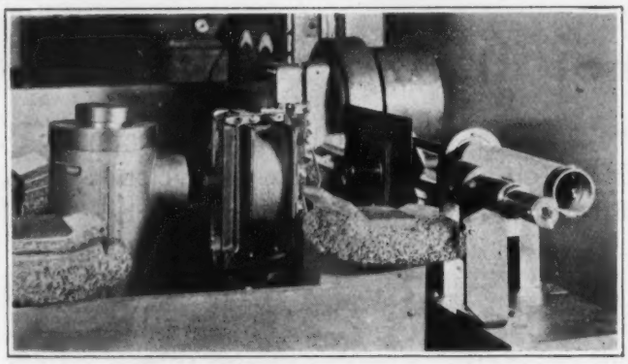
IN USE this week between Cleveland and New York, giving Easterners daily current pictures of the Republican convention at the former city, is the newly perfected and recently announced equipment for electrical transmission of photographs. One hundred Eastern newspapers have been receiving telegraphed pictures from Cleveland and have had them in their papers on the streets within one or two hours after the pictures were taken in Cleveland.

While some of the more involved technical details are at present not announced, the following description will be of interest to electrical engineers:

A photograph is taken on a film in the usual manner. As at present developed a 5-in. x 7-in. film is used. From this a positive film is made which is inserted in the "transmitter" simply by rolling it up in a cylindrical form. A small and intense beam of light shines through the film onto a photo-electric cell within the cylindrical film. The film is rotated at a uniform speed and by means of a screw mechanism is caused to advance parallel to the axis of the cylinder a distance of $\frac{1}{25}$ in. for each revolution of the film. The motion of the beam of light relative to the cylinder is therefore the same as that of a phonograph needle relative to a cylindrical record. In this way each minute portion of the picture in turn affects the intensity of the light reaching the photo-electric cell, this statement being true in so far as the line or rather spiral upon which the light beam travels represents the entire surface of the film. As noted in the accompanying reproduction of two photographs which have been transmitted by wire, the line traversed by the light beam when the film is finally unrolled forms what might be termed a "line-screen" picture. The photo-electric cell on which the light beam falls is in an electric circuit which also includes the grid of a vacuum tube so connected that the variations in potential in the grid serve to modulate the transmitting carrier current. The photo-electric cell developed for this service is one whose electron emission is directly proportional to the intensity of light upon it. The relation between the light falling on the cell and the electron stream is a straight-line one, and therefore the variation in grid potential of the vacuum tube mentioned above is in direct proportion to the various shades of light and dark on the negative film. The actual connection between the photo-electric cell and the vacuum-tube modulator is through a vacuum-tube amplifier in

PHOTOGRAPH OF CLEVELAND BUILDING SENT OVER TELEPHONE WIRES TO NEW YORK

ILLUSTRATION OF HOW DETAIL CAN STILL BE RETAINED IN TRANSMISSION OF PHOTOGRAPHS



RECEIVING OF PICTURE OVER WIRE MADE POSSIBLE BY NEWLY DEVELOPED "LIGHT" VALVE

order to magnify the effect upon the grid. The vacuum-tube modulator in turn controls a 1,000-cycle carrier current which is flowing through the telephone line.

At the receiving end an unexposed photographic film, rolled into a cylinder as at the transmitting end, is rotated under a beam of light in a manner similar to that at the transmitting end. The two rotating cylindrical films are kept in synchronism in a manner somewhat similar to the synchronizing mechanism in multiplex telegraphy. It is actually effected by direct impulses through a 400-cycle current which is also transmitted over the same telephone line from the sending to the receiving end. The 400-cycle current and the 1,000-cycle current are fed into the transmitting end and "unscrambled" or separately filtered at the receiving end in a manner similar to that in which the frequencies are supplied to the line and taken from the line in the systems of multiplex telephony and telegraphy developed and put into service over long-distance lines within the last three or four years.

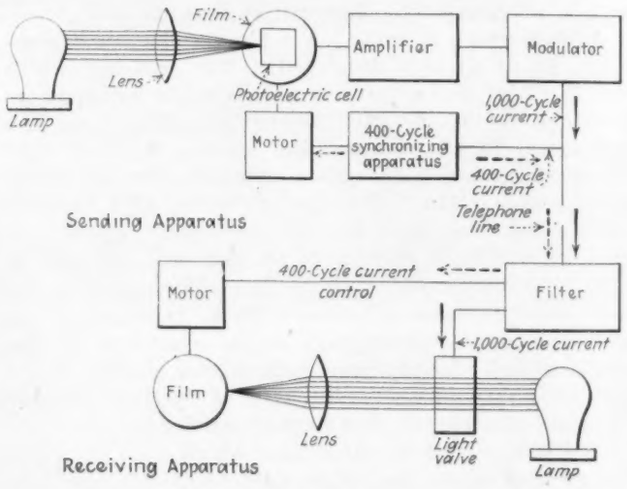
UTILIZES NEWLY DEVELOPED "LIGHT CELL"

The impulses or modulations coming in over the 1,000-cycle carrier current are amplified and transferred to the newly developed "light cell," which causes a light beam to vary in size directly in proportion to the alternating current received. This light beam in turn falls upon the rotating film and produces a positive of the picture.

From the positive thus produced at the receiving end any number of negative films can, of course, be made in turn by simple exposure or photographic printing method. These newly exposed negative films must of course be developed and dried and are then in such form that they may be used directly for making line cuts or cuts by the halftone process (in the latter case the halftone screen is turned at an angle of 45 deg. so that the lines of the screen line up with the lines along which the light beams have traveled and therefore do not make a "pattern") for newspaper reproduction.

The telephone line which is used for such work can be used in regular telephone and telegraph service until the actual time that photographic transmission is desired, when by merely switching from telephone equipment to photographic transmission equipment the line is all ready for the latter service. The system may also be used for radio transmission.

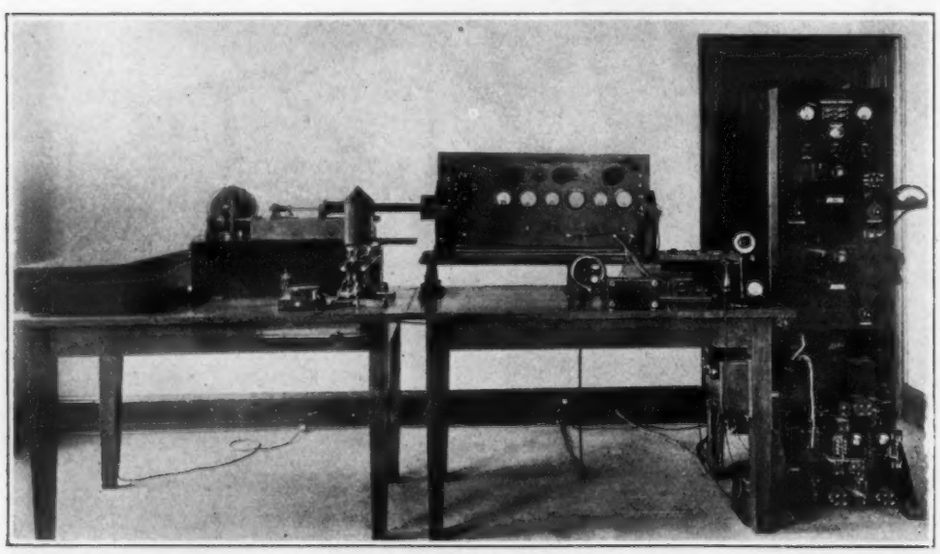
The simplicity of the method is such that it is not necessary to wait for the original positive film to dry, for



SIMPLIFIED DIAGRAM ILLUSTRATING PRINCIPLE OF ELECTRICAL TRANSMISSION OF PHOTOGRAPHS

it is only its effect upon a light beam passing through it that is desired. As soon as it is developed therefore transmission can start, and the rapidity of action of the photo-electric cell at the sending end and the light cell at the receiving end is such that a 5-in. x 7-in. photograph can be transmitted in less than five minutes.

The apparatus in its present form represents, it is apparent, the association of many recent inventions, together with standard types of telephone and telegraph apparatus which have been readapted to this new use; but the development as a whole is the direct and specific work of the division of development and research of the American Telephone & Telegraph Company, whose directing head is Gen. John J. Carty, and associated with them the engineers of the Western Electric Company.



APPARATUS BEING USED AT CLEVELAND FOR SENDING PICTURES TO NEW YORK OVER WIRES

Service Fuses Versus Circuit Breakers

Universal Service Entrance and Meter Requirements Met by Properly Designed Combination Fuse and Switch Boxes—Necessity of Adequate Fuse Protection—Disadvantage of Circuit Breakers—Disagrees with Fryer and Gregory

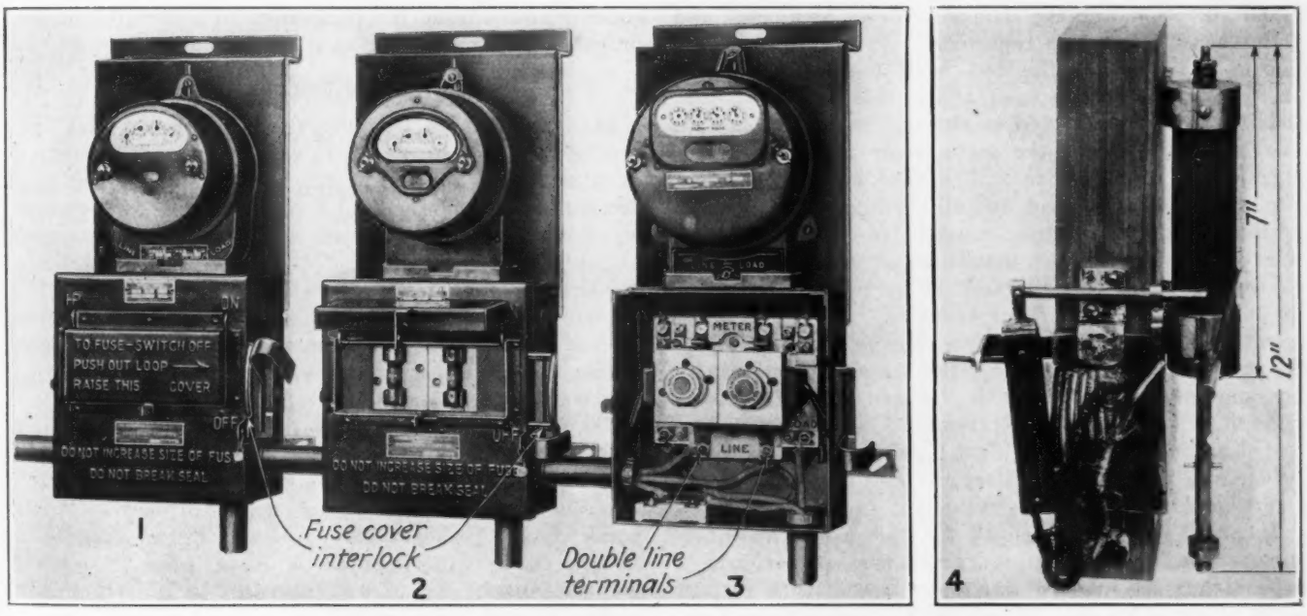
By GRANVILLE E. PALMER
President Palmer Electric & Manufacturing Company, Cambridge, Mass.

IN THE ELECTRICAL WORLD of May 17, 1924, there appeared an article by R. C. Fryer and L. J. Gregory entitled "Fundamentals of Meter Service." While I am in hearty accord with the authors that an unfortunate situation exists in regard to meter service-entrance devices in some localities, I disagree with their conclusions that such conditions are in any way an inherent characteristic of the inclosed fused switch, or that an engineering or economical cure of the situation is to be found in substituting a circuit breaker for the conventional service fuse whether or not the breaker is combined in one inclosure with the meter element.

Possibly some comment is in order with regard to the history of the inclosed fused switch as applied to meter service entrances. The first commercial apparatus of this type was designed to comply with the requirements of the utility companies and was purchased, installed and maintained by them under their seals for the sole purpose of maintaining supervision over their unmetered conductors on the properties of their customers. Safety was not the dominating consideration, and the demand for this product originated with the utility companies of New York, Baltimore, Providence, Buffalo, St. Louis and Philadelphia for the purpose stated—namely, to prevent tampering.

In this early apparatus safety was in no way a consideration with respect to fuse replacement and was quite impossible to provide, as at that time the accepted and rigidly enforced code rule required that the fuse be handled on live terminals, and where such terminals are accessible in proximity to a grounded inclosure, which appears to be the authors' only conception of what an inclosed fused switch is, I am in no way surprised at their conclusion—arrived at from a consideration of only such devices as fail to answer the fundamentals of a service-entrance cabinet.

Messrs. Fryer and Gregory correctly state that the fundamental requirements for meter service boxes are threefold: "(1) Protection against fire and personal hazard; (2) protection to the utility company against unauthorized tampering with service; (3) as a commercial proposal, sufficient inducements must be offered in addition to the protective feature to induce either the utility or the consumer to invest the necessary capital."



SWITCHES AND BREAKERS TO MEET UNDERWRITERS' REQUIREMENTS

Figs. 1, 2 and 3—Typical class "AA" switches. Left to right, switch closed, switch open for fuse replacement, switchbox cover removed for inspection or test. Fig. 4—Circuit breaker for 30 amp. or below

CLASS "AA" SWITCH IMPORTANT

These authors argue that none of these fundamentals are fully met by inclosed fused switches, and I am in agreement with them where "class B" Underwriters' switches, such as they describe, are used; but in directing attention to the unsatisfactory possibilities of fuse renewals at service entrances as judged from the standpoint of the utility it seems unfortunate that they did not give consideration to other classes of approved Underwriters' switches, such, for example, as the "Class AA," which fairly meets the requirements they state under (1) and (2) above; and, as the fire code requires

an inclosed Underwriters' switch at every service entrance, neither the utility nor the customer stands in need of any "inducement" to invest in such apparatus as such outlay is a fundamental requirement in securing meter service. The "AA" Underwriters' switch unquestionably meets all of the requirements which these authors state are fundamental.

The fire code, with which all service entrances must comply, specifically calls for an inclosed box that can be locked or sealed, and the fire code "AA" inclosed-switch classification provides a box in which the switch may be operated or the fuse replaced or inspected without opening the case or exposing live terminals, thus providing every guard against tampering which the utility can ask, a point apparently overlooked by Messrs. Fryer and Gregory.

TYPES OF SWITCHES

A bank of three Underwriters' "Class AA" switches is illustrated herewith, with meter boards, meter and trim. The board supports the meter and has provision for leveling it; the trim, which is a part of the box, adapts it to any make or meter. This trim, being universal, meets the important point of meter terminal standardization, and the trim also serves as a blank end wall when the meter is removed.

Fig. 1 illustrates the box with the switch closed. In Fig. 2 the switch is open, and in this switch position the fuses may be exposed as shown. In Fig. 3 the seal has been broken and the main cover removed for inspection or test purposes. The fuse when exposed in Fig. 2 is necessarily dead, and all Underwriters' switches of this "AA" classification must be so constructed that they cannot be installed or used so as to expose normal current-carrying parts to contact by persons replacing or inspecting fuses without breaking the seal. Consequently, when switches of this classification are used, the customer can offer no objection to sealing the service box, no matter who owns it. There is no reason to open it, and so long as it remains sealed he is protected against fire and accident hazard, which, as stated by Messrs. Fryer and Gregory, is the first fundamental requirement of a meter service box.

I cannot, of course, speak for the meter manufacturers, but, as a manufacturer of some experience, I believe that the modern watt-hour meter, with respect to its dimensions and terminals, has reached an irreducible minimum and that it would be highly undesirable to dispense with any part of its present inclosure for any purpose. I would further question the economies deemed possible through the inclosure of the meter in a cabinet containing the service control equipment as compared with the construction suggested in the accompanying illustration, and I further believe that most meter engineers would question the advisability of subjecting the meter element to the abuse it would receive in making conduit connections to its inclosing case.

This leaves, I believe, no serious points to be disposed of except the relative reliability of fuses and circuit breakers and the hazards involved through the use of improper fuse substitutes as compared with that of inoperative circuit breakers at meter service entrances.

I hold no brief for either the fuse or the circuit breaker, and while the circuit breaker has marked economical advantages over the fuse where heavy overloads occur frequently, it is quite general practice to supplement such circuit breakers with reliable fuses when they are installed at points where expert attention is not constantly available; while the fuse alone is generally conceded to supply adequate protection to the service entrance. A fortunate characteristic of the fuse is that deterioration of its parts almost invariably results in its opening the circuit below its normal rating, and an unfortunate characteristic of the circuit breaker is that deterioration of its parts almost invariably results in its failing to open the circuit at its normal rating, if it opens at all; so that if the reliability of the two devices is to be judged, deterioration must be considered as a factor where the location of their service is far from ideal as at the normal meter entrance.

It is true that the "coppering" of fuses is a serious menace, and it seems to me that too little attention has been given to the subject of educating the public in this regard; but the seal on the service box, where the fuse is not accessible without breaking the seal, has been found to be of little value when service outages due to overloads or other causes occur. So it seems to me unreasonable to conclude that the seal on a box containing a circuit breaker will not be broken, when the breaker will not stay closed on an overload. Moreover, a person who would copper a fuse would be equally capable of changing the calibration of a circuit breaker or rendering it inoperative.

NOTICE ON SERVICE BOX

It is my opinion that overfusing or the use of improper fuse substitutes can to a large extent be remedied by a notice on the service box, preferably applied in a decalcomania transfer, and I suggest some appropriate wording for this notice such as: "For your protection use only National Electric Code fuses. Do not increase the size of fuse. Do not break seal. See Contract for electric service." A label of this kind is more effective than a tag, and the decalcomania is both durable and legible. A clause in the service contract emphasizing this warning is also worthy of consideration.

There are some problems of design in connection with circuit breakers inclosed in grounded boxes that where space factor and economy in dollars and cents are to be considered do not appear capable of easy solution. Small circuit breakers for service-entrance work such as are being experimented with in some European countries would in no way conform to the standards of this country, and this would be particularly true if they were inclosed in a grounded metal box where an arc to the case would produce a short circuit to ground.

This consideration appears to eliminate any form of circuit breaker design except those where the arc is confined, and Fig. 4 gives the approximate minimum dimensions of a 30-amp. tube-type circuit breaker capable of rupturing 125 volts direct current under the same standard conditions as would apply in the Underwriters' test of an ordinary Edison plug fuse which complied with the National Electric Code standard.

SMALL-CAPACITY CIRCUIT BREAKERS COSTLY

In considering fuse and circuit-breaker design I naturally suppose that any apparatus to be used must be such that the factors of safety in its operation will meet the established American standards prescribed by the Underwriters' Laboratories. The classification "AA" fused switches herein considered are listed as meeting these standards by the laboratories, and the circuit-breaker design illustrated in Fig. 4 was developed to meet their minimum requirements. The trip coil of

such breakers to be acceptable should have no greater wattage loss than that of its equivalent fuse, and the iron and coil of the breaker illustrated were designed on the basis of this consideration.

Over 85 per cent of the service installations in this country call for a protective equipment of 30 amp. or less capacity, and such equipment should be capable of accurate calibration at 15, 25 and 30 amp. properly to protect the conductors of conventional size. This, of course, is perfectly practical in a circuit breaker, but equally so in a fuse, and with the present commercial developments as a basis of comparison, the fuse certainly has an immense advantage from the standpoint of economy.

The necessity of frequent fuse renewals at the service is a clear indication of improper conditions not capable of cure by a perfectly acting trip-free circuit-breaker, which in its simplest conceivable form adds to the system a complication of coils, springs and latches that require the services of a skilled mechanic to adjust in co-ordinate relation. Even when this relation exists, the service rendered can only equal that of the fuse in an Underwriters' classification "AA" switch, which effectively guards against whatever hazard may be involved, protects the utility interest and preserves the good will of the customer.

Why Pay for Engineering Services?

An Every-Day Situation that Arises with the Construction and Reconstruction of Electric Light and Power Equipments

BY H. O. SWOBODA, INC.
Consulting Engineers, Pittsburgh, Pa.

"WHY pay for engineering services? If we install any electrical equipment, the electric company supplying our district with power gives us all the information we need free of charge; if we purchase machines or motors, their manufacturers do the same, and we have a good electrician who does all our planning and handles all such propositions for us. If we must go on the outside for the work, we call in a contractor who lays out the plans free of charge when he prepares his bid. We don't need a consulting engineer. Why should we spend the money for one?"

Even in this enlightened day, after a world war demonstrated what engineering can accomplish, such statements are made by men of standing. They honestly believe that by following such a course they are saving money. Actually by this procedure each year they sacrifice a pile of money on the altar of ignorance—not ignorance in their line of business, but ignorance in the way they install and operate their electric plant.

Electrical equipment presents a rather unassuming appearance. It is quiet, often concealed, and engenders but one thought, that it is there, ready for work when called upon. As a matter of fact, the electrical equipment is to any plant what the blood system is to the human body. The dynamos or the electric company's transformers are the heart of the system, the electrical circuits the arteries, the motors and lights the organs, and the switchboard, controlling everything, the brain. When any part is ill the whole system may be affected. A plant with a poorly laid-out electrical system is like a man with a sick body.

Daily these electrically sick plants drain the company treasury—very often without the realization that such a condition exists. Only after a failure in all or part of the system, causing shutdowns with thousands of dollars' loss in business; after being confronted with the need of ripping out a considerable part of the equipment when a comparatively small addition or change is to be made to the plant, or after enormous electric bills arrive, do some realize that they have a sick electrical system and seek a permanent cure through the services of a competent engineer.

ANALYSIS OF OBJECTIONS

That the attitude outlined in the foregoing paragraphs is a "penny-wise and pound-foolish" policy may be seen from the discussion of the erroneous ideas mentioned in the beginning:

1. *"The electric company gives us all the information we need free of charge":*

Most electric companies have competent engineers and, in the interest of selling their energy, gladly give some engineering information gratis. At the best, however, they can only touch the high spots of the problem, recommending an equipment most satisfactory from the electric company's point of view. This is not a reflection upon the electric company, as the cost to prepare plans and to give each customer's plant the careful study necessary for economical installation and operation would lead to bankruptcy.

What voltage to use, where to place the switchboard, how and where the circuits should be subdivided, how to insure the least danger of shutdown, where to purchase electrical material at the lowest price, how to keep the bills as low as possible, and how to avoid extras, are a few of the many questions which the company cannot afford to go into except most superficially.

The electrical system of a plant, though appearing insignificant, is quite complex and should be just as carefully designed by an engineer as a building is designed by an architect.

How can an experienced business man expect all this electrical information he really needs, free of charge?

2. *"If we purchase machines or motors, the manufacturers give the motor sizes and the wire sizes":*

Most purchasers imagine that this is all the information necessary. What about the following? Does he know—

That machine manufacturers generally specify motors too large? This means that first costs and operating costs will be higher than necessary.

That the motor sizes may be right but the type of motor wrong? The presence of acid vapors, moisture, dust, excessive room temperature and unusually severe starting conditions may cause endless trouble unless the proper type is ordered.

That there is a choice of several voltages and that the selection of one voltage over another for a new plant may mean a difference of 100 per cent or more in the cost of wiring?

That the wire sizes furnished by the motor manufacturer are a very small and insignificant part of the wiring? They can only be used to the point of connection with the feeder or sub-feeder, and the information on the size of feeders, sub-feeders, switches, fuses, switchboard and on the system as a whole, which he does not furnish, is the most important information. It can be obtained only by a study of the whole situation, which the manufacturer of the machine or motor cannot afford to give.

That, finally, the invitation of competition by asking bids from more than one manufacturer is most deceiving, as the lowest prices received are usually low because of the omission of items on account of incomplete specifications or none at all, and that later on these omitted items must be purchased at higher prices.

The man who proceeds with his electrical work on the meager information supplied by the manufacturers is un-

knowingly inviting unnecessary losses in making the installation and in the years of operation which follow.

3. "Our electrician will plan the work for us. He is a clever chap and understands such work thoroughly":

Right here a very much misunderstood subject must be cleared up. There is as much difference between an electrician and an electrical engineer as between day and night. An electrician is an electrical mechanic. His work is to install and operate electrical apparatus. He knows how to install lights, how to set motors, rewind them, connect them, string wires, splice them, erect switchboards, install switches, etc. An engineer's work is to plan and design a system based on the necessary calculations and studies.

An electrician must not be expected to plan an electrical layout as he has not been trained to do so.

He must not be expected to be an expert in illumination. Proper illumination means increased production, better inspection, avoidance of glare and eye strain; but to obtain such results requires a scientific knowledge of illumination and a commercial knowledge of fixtures, reflectors and glassware—things beyond the province of an electrician.

He cannot be expected to keep in touch with the ever-increasing number of rules and regulations of the states, municipal governments and the National Board of Fire Underwriters, as he is without the facilities to do so. Instances are constantly arising where electricians, classed as engineers by their employers, have purchased apparatus which has had to be scrapped or exchanged on account of violating some law or insurance regulation.

Just as it is unfair to expect a dentist to design dental machinery or a structural steel worker to design a skyscraper, so it is unjust to expect an electrician to do the work of an engineer.

4. "The contractor will do all the work for us free of charge":

The work of the contractor is similar to that of an electrician, viz., to install equipment, not to design it. He will, of course, like the electrician, put in equipment without working from plans and specifications, and the equipment will operate in some sort of fashion; but frequently someway, somehow, some time, it brings grief. However, should the contractor be capable of laying out and take the time to lay out a proper and economical equipment, he will be obliged to advance his contract price to take care of this additional expense. This increase quite often would make his bid so high that he could not compete and would lose the contract altogether. This situation compels him to eliminate a great many items which should be provided in a first-class equipment, or, in other words, to "skin the job" and to depend for a profit upon the extras which later on are apt to follow on account of these omissions and on which he quite often can make his own price.

In short, the "free of charge" work of the contractor is a delusion.

From the foregoing it should be evident that getting something for nothing from the electric companies, manufacturers, electricians and contractors is a rather expensive proposition, and that the most economical procedure after all is to employ an electrical engineer. The question then arises, "Just what does the consulting engineer do?" The answer is as follows:

WHAT THE CONSULTING ENGINEER DOES

He studies the entire situation from the ground up.

He co-ordinates his layout so that each section of the building or buildings can be conveniently controlled without interfering with another.

He designs the system so that the breakdown of any apparatus will not cause a shutdown of the remaining part of the plant.

He plans for the future so that further extensions can be added later without interference with existing apparatus or requiring the tearing out of any part.

He plans an economical installation without "skinning the job."

He secures the complete equipment at lowest prices from carefully prepared plans and specifications, avoiding extras with their excessive charges.

He arranges the equipment in such a manner that the power consumption as well as the demand will be a minimum and that the power factor will be high.

He insures, by inspection, that the equipment will be installed as intended. Those who furnish the work will be compelled to do this as all points are covered in detail in black and white either on his drawings or in his specifications.

He obtains the most favorable contract from the power company, if power is purchased.

An investment in competent engineering services pays large returns.

Central Stations in the United States Now Total 5,826

FOLLOWING is the ELECTRICAL WORLD'S segregation of the central stations in the United States, its Colonial possessions and Canada as of January 1, 1924, as indicated by the 1924 McGraw Central Station Directory:

CENTRAL-STATION COMPANIES AND MUNICIPAL PLANTS IN THE UNITED STATES, ITS POSSESSIONS AND CANADA, AS OF JAN. 1, 1924

State or Possession	Total Central Stations	Central-Station Companies	Municipal	Companies Selling Supplies	Companies Doing Contracting work
Alabama	65	30	35	25	18
Alaska	12	11	1	9	9
Arizona	32	28	4	14	10
Arkansas	85	62	23	51	38
California	79	58	21	31	21
Colorado	72	45	27	47	31
Connecticut	43	40	3	27	3
Delaware	15	6	9	3	4
District of Columbia	3	3	0	0	0
Florida	89	42	47	31	17
Georgia	156	47	109	56	49
Hawaii	8	8	0	4	4
Idaho	48	32	16	26	22
Illinois	271	178	93	124	82
Indiana	202	120	82	82	55
Iowa	223	122	101	117	86
Kansas	252	77	175	120	106
Kentucky	113	89	24	63	52
Louisiana	75	33	42	44	27
Maine	79	74	5	43	24
Maryland	46	35	11	24	17
Massachusetts	122	81	41	68	4
Michigan	187	102	85	114	86
Minnesota	216	94	122	111	92
Mississippi	94	42	52	41	27
Missouri	217	151	66	126	103
Montana	53	48	5	29	25
Nebraska	254	97	157	130	115
Nevada	15	13	2	8	6
New Hampshire	51	47	4	28	16
New Jersey	56	43	13	25	3
New Mexico	27	22	5	20	16
New York	296	236	60	145	62
North Carolina	148	84	64	54	41
North Dakota	140	100	40	91	85
Ohio	276	164	112	81	48
Oklahoma	138	57	81	50	47
Oregon	56	43	13	34	19
Pennsylvania	233	187	46	89	51
Philippine Islands	5	5	0	3	3
Porto Rico	7	5	2	4	3
Rhode Island	12	10	2	7	0
South Carolina	81	48	33	34	28
South Dakota	115	65	50	64	57
Tennessee	100	69	31	53	35
Texas	308	271	37	197	160
Utah	42	22	20	17	15
Vermont	56	46	10	31	16
Virginia	95	72	23	44	31
Washington	81	66	15	48	33
West Virginia	74	68	6	28	25
Wisconsin	262	171	91	136	102
Wyoming	41	32	9	23	20
U. S. total	5,826	3,701	2,125	2,874	2,049
Canada	548	220	328	223	142
Grand total	6,374	3,921	2,453	3,097	2,191

A New 110,000-Volt Suspension Insulator

A Single-Unit-Type Suspension Insulator of Radical Design Proposed for High-Tension Service—Details of Development and of Unit and Comments of Engineers at Recent A. I. E. E. Meeting

A RATIONALLY designed suspension-type insulator embodying the principle of using one unit on 110,000-volt circuits, two units on 220,000-volt circuits, etc., was described by Prof. H. B. Smith of Worcester Polytechnic Institute at the district convention of the American Institute of Electrical Engineers held in Worcester last week. The design of this insulator was made on the basis of an analysis of dielectric fields and the gradual development through experiments and tests of an insulator which would follow rational design principles while at the same time conforming to requirements of mechanical strength and eliminating the necessity for the use of porcelain.

The type of insulator developed as a result of the experiments is shown in Fig. 1, while Fig. 2 shows the dielectric field lines of this type of insulator as indicated by powdered asbestos. The development at present has reached the stage where the engineering and design principles are established and the unit has been made.

The actual rating now remains to be established under service conditions, and the effect of service on modifying the design, if necessary, is yet to be determined. The test values on this insulator range at about 280 kv. or more dry and 200 kv. or more per unit under standard wet-spray tests. No corona is visible on any part of the insulator until within about 5 per cent of breakdown voltage. Two units in series require about 500 kv. dry or 350 kv. wet for breakdown. These values are without capacity modification which could be readily obtained to improve them.

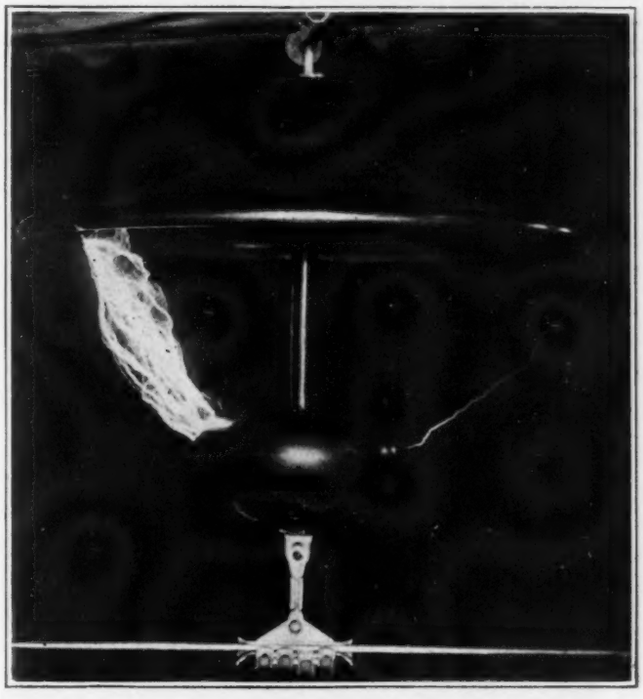


FIG. 1—A FLASH-OVER TEST ON INSULATOR

The arc strikes from the grounded metal top or umbrella to the lower metal without any previous visual indication of corona formation and without any tendency to impinge on the impregnated wood insulator stick separating the metal parts. This effect is obtained by shaping the insulator members to control the dielectric field distribution.

DESCRIPTION OF THE UNIT

A cross-section sketch of the unit is shown in Fig. 3. The unit is made at present of a spun-copper grounded top shield or umbrella and an insulator stick of impregnated wood which connects the top shield to the lower spun-copper shield. This insulator stick is so designed as to be located in a dielectric field of low density as compared with the density of the surrounding outer dielectric field. This prevents any opportunity for arcing to carbonize the wood stick or arcs to burn it under flashover conditions, and by the arrangement used corona formations at the terminals of the stick are eliminated because the shields are shaped and placed to prevent gradients of any magnitude in comparison with the gradients in the exterior.

The design principles of the proposed insulator consist of placing the insulating surface under more favorable conditions for operation especially after corona and arcing, simplifying the form of the insulating surface for convenience in manufacture, making an insulator which is free from corona breakdown previous to flashover, and securing reduction in weight, length and cost and the production of a higher-voltage unit insulator which eliminates porcelain, if possible.

The design principles were carried out by the production of a hollow electric field, by which is meant one surrounded symmetrically along its axis, plane or other surface by a stronger field of higher average and maximum potential gradient, and placing in this hollow field the insulating member. In combination with this hollow field the metallic electric flux-distributing terminals were shaped to produce along and near the axis of the field a field of force with lines so distributed as to conform to the surface of the insulating (mechanical-strain) member which shall be most desirable from purely mechanical considerations of strength and manufacture. In combination with these elements the metallic flux-distributing terminal members were proportioned so as to eliminate corona formation anywhere on the insulator prior to a close approach to breakdown voltage and well above operating voltages. There should be, besides, no possibility of corona or arcing along the single insulating surface, and the maximum practical dielectric strength lies along the insulating surface, which combined with ample mechanical strength is used to produce a single-unit insulator suitable for use on 110,000-volt power lines, two units in series for 220,000-volt lines and, when necessary, three units in series for 330,000-volt lines.

DISCUSSION OF INSULATOR

In discussing the insulator, E. M. Hewlett stated that in the early days of the suspension-type development it was found that any material that will carbonize does

so under service conditions. He said that Professor Smith had distributed the strain and limited this effect materially in the proposed insulator, but questioned whether or not in fog or in alkali dust there may not be a little static or a little leakage which will start carbonization. In his opinion, if a better porcelain can be obtained, much better results can be recorded for the present types of insulators, particularly as the use of the multiple-disk insulator of the suspension type with the shield ring enables engineers to limit potential stresses on lower units, and this principle can be carried still further to higher voltages. He

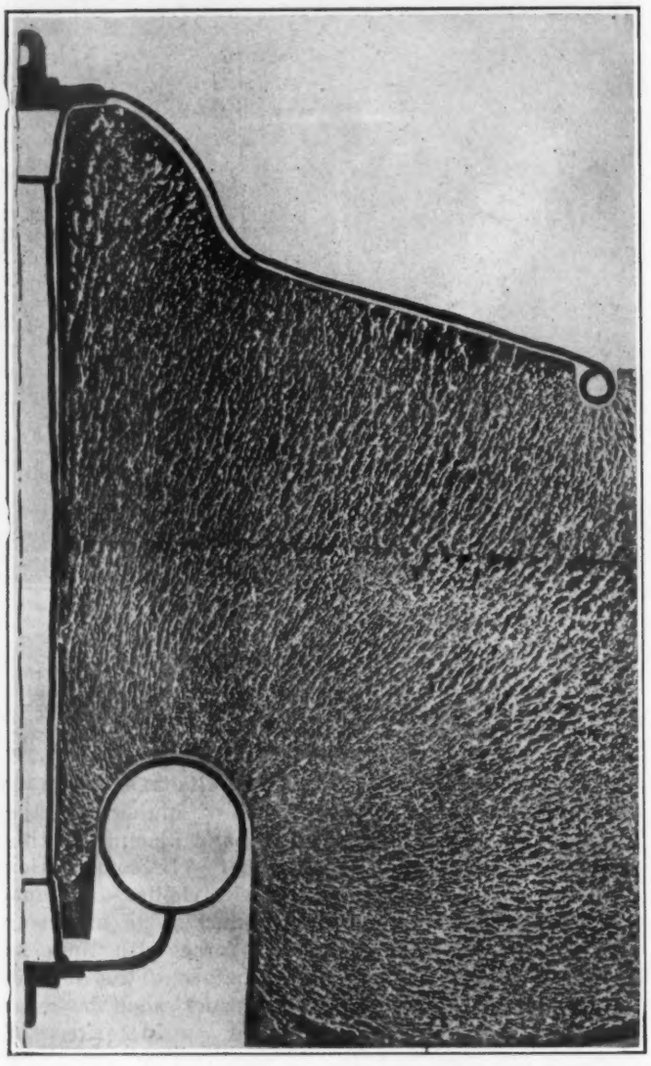


FIG. 2—DIELECTRIC FIELD DISTRIBUTION OF INSULATOR

also held that other elements affecting the proposed insulator were its size and the difficulty that might be encountered in transporting or installing the unit in rough or mountainous country.

In the opinion of C. E. Skinner, the proposed insulator is an epoch-making step toward the elimination of a big difficulty in insulation. In the proposed insulator the chief question lies in regard to the spindle or insulating member, but from his observation of many experiments and a knowledge of the results of many aging and weathering tests on the impregnated wood used, he was convinced that the impregnated wood had great possibilities.

The insulator has been the guiding element in the development of high-voltage insulation, Prof. C. F. Scott asserted. The pin-type insulator limited transmission to around 60,000 volts maximum, and then came the suspension type, which enabled transmission voltages to go to 220,000 volts and even higher, and the type of insulator now proposed enters the field under competitive conditions with the suspension-type insulator to give a new and radically different insulator for consideration in high-voltage transmission. The fundamental element in the design of the proposed insulator is its rational and radical basis and its elimination of the necessity for the use of porcelain. The result has been to eliminate most of the insulator problems and leave only the problem of surface leakage.

QUESTIONS TIME LAG ON BREAKDOWN

Professor Smith was complimented on the rational way in which he had developed and designed the insulator by Prof. V. Karapetoff, who stated that he would be glad to know whether the design of the insulator was such as to give flashover instantaneously without intermediate corona or whether there was a definite time lag with an ionization layer and any definite corona formation previous to breakdown and flashover.

From the operator's point of view, the new insulator has possibilities, but field service conditions will be necessary before its real value is known, F. L. Hunt maintained, and H. A. Stanley inquired whether the insulator could be developed for use in the horizontal position.

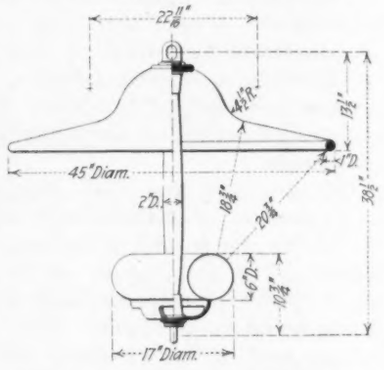


FIG. 3—DIMENSIONS OF INSULATOR FOR 110,000-VOLT SERVICE

In closing the discussion, Professor Smith said that as compared with air immediately about the insulating stick the flux in the stick is denser, but the distances are such exterior to this portion of the insulator that the density is much greater in the outer area and the effect of this strong field is to expel particles of dust and moisture and very largely prevent them getting in contact with the stick. However, only service can tell how much this effect will be. The size of the insulator is not large viewed from the perspective of a tower, and the parts before assembly are not heavy, so that difficulties of installation and transportation are not very serious. For convenience, he stated, the hood and shields are at present made of spun copper, but there is no inherent element which prevents them being made out of any metal. Visible corona does not appear until near breakdown on the insulator, and under service conditions the insulator operates at about half breakdown voltage. Thus it has neither a long time lag nor a quick time lag, but an intermediate condition. He also stated that the insulator could be designed readily for use in a horizontal position.

The fact was emphasized by Professor Smith that field service tests over a period of time would be required to give the complete answer to the service use of the insulator, but that tests already made were so encouraging that he was confident the insulator would be found satisfactory as an improvement on existing designs for use on high-voltage lines.

Ampere-Turns for Saturated Teeth

Approximate Method of Computation Which Will Be Found Sufficiently Accurate for the Purposes of Design

BY VLADIMIR KARAPETOFF

[In a machine with saturated teeth the flux in the slots must be taken into account because otherwise the computed number of exciting ampere-turns becomes excessive. The author refers to some curves between the real and apparent flux density in his "Magnetic Circuit" and points out that these curves have to be recomputed for every new saturation curve of iron. Assuming the portion of the *B-H* curve above the knee (the thigh) to be a straight line, a simple approximate formula for the real flux density in teeth is deduced. This formula can be used for any straight-line saturation curve knowing its intercept on the *B* axis and the slope. A numerical example is solved.]

WHEN the magnetic flux density in the teeth of an electric machine is high an appreciable portion of the total flux passes through the slots. In computing the number of exciting ampere-turns it is necessary to know the *real* flux density, B, in the teeth, as distinct from the so-called *apparent* flux density, B_{ap}. The latter is obtained by dividing the total flux per tooth pitch by the cross-section of the iron paths only. In other words, B_{ap} is the flux density which would obtain if there were no flux through the slots. In applications B_{ap} is usually known and it is required to determine the corresponding B. Knowing B, it is possible to find the ampere-turns per unit length of the tooth, say H, from the saturation curve of the material used (see figure).

The usual method of determining B from B_{ap} leads to an equation which can be solved only by trials or graphically. Namely, let the net cross-section of the iron in the tooth be A_i and the cross-section of the air-paths per tooth-pitch be A_a; in A_a are included the slot proper, the air spaces between the laminations of the tooth and the air ducts. Then, if ϕ_t is the flux per tooth-pitch, we have

$$\phi_t = A_i B_{ap} = A_i B + A_a B_a, \qquad (1)$$

where B_a is the flux density in the air spaces. Assuming the lines of force to be parallel straight lines both in the air and in the iron, the magnetizing force H is the same in both, so that for the air we can write

$$B_a = \mu_a H, \qquad (2)$$

where μ_a is the absolute permeability of the air in the system of units.* Substituting the value of B_a from equation (2) in equation (1) and dividing by A_i, we get

$$B_{ap} = B + \mu_a H (A_a/A_i), \qquad (3)$$

or

$$B_{ap} = B + aH, \qquad (4)$$

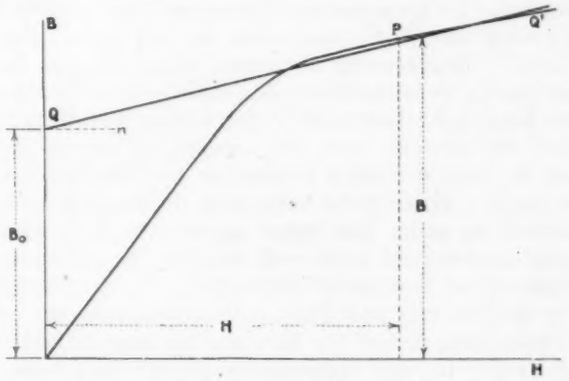
where

$$a = \mu_a (A_a/A_i). \qquad (5)$$

Equation (4) can be solved for B by either of the two methods: (a) By trials, using the magnetization curve of the laminations and trying different points on it until the values of B and H are found which satisfy the above equation for given values of a and B_{ap}. (b) By drawing the straight line represented by equation (4) and finding its intersection with the *B-H* curve.

The relationship between B and B_{ap} can be also computed once for all for various values of H and a, and plotted as a set of curves.† With the aid of such curves, B can be read off directly for any given values of a and B_{ap}. Of course, these curves hold true only for a specific *B-H* curve of iron. The disadvantages of such curves are (a) the time taken in computing them, (b) the fact that they have to be plotted anew for each material of different magnetic properties, (c) the necessity of interpolating between two curves for an actual value of a. With a steady improvement in the permeability of iron, a careful designer has to recompute such curves from time to time. Thus many disadvantages exist in the usual methods for designers to apply.

The following approximate analytical method obviates all these disadvantages and permits a quick computation of the value of B for given values of B_{ap} and a and for any given *B-H* curve. The method is based on the fact that the difference between B and B_{ap} becomes



THE ORDINARY *B-H* CURVE FOR SATURATED TEETH CAN BE APPROXIMATED BY A STRAIGHT LINE

appreciable only beyond the knee of the saturation curve, where a given *B-H* curve can be approximately replaced by a straight line QQ' (see figure). Let the equation of this line be

$$B = B_o + nH, \qquad (6)$$

where B_o is the value of the intercept on the B axis and n is the slope, expressed as the increase in B per unit of H. Substituting the value of H from equation (6) in equation (4), and solving for B, the following equation is obtained:

$$B = \frac{B_{ap} + B_o(a/n)}{1 + (a/n)}. \qquad (7)$$

This simple approximate formula takes the place of a whole set of curves.

Example.—Let the upper part of the saturation curve on page 103 (*ibid*) be replaced by a straight line passing through the points corresponding to the values of real flux density B of 22 and 25 kl. per square centimeter. For this straight line, $B_o = 19.9$ kl. per square centimeter, and $n = 3$ kl. per kilo-ampere-turn per centimeter. With these units $\mu_a = 1.257$ perms per centimeter cube. Let it be required to determine the value of B for $B_{ap} = 27$ kl. per square centimeter and for the ratio of air to iron equal to 1.5. Then $a/n = 1.257 \times 1.5/3 = 0.628$ and, according to formula (7):

$$B = (27 + 19.9 \times 0.628)/1.628 = 24.3 \text{ kl. per square centimeter.} \qquad (8)$$

This value checks almost exactly with that on the corresponding curve.

*See the author's "Magnetic Circuit," page 11.

†See *ibid.*, page 103.

How Fast Is the Small Customer's Use of Energy Increasing?

Investigation in the State of New York Shows that the Average Domestic and Commercial Customer Used Less Energy in the Year 1923 than in 1910—Small Consumer's Load Must Be Developed

By WILLIAM M. CARPENTER
Engineer for the Empire State Gas and Electric Association

REMARKABLE increases in the sale of electrical energy during the last decade have necessitated an almost continuous program of construction of new power plants, transmission and distribution systems by the central-station industry. As an example of progress and growth this expansion has been unequaled in any other line of activity. Engineering forecasts, based on the theory that energy consumption will double every eight years, have been more than fulfilled, for during certain periods, taken the country over, the amount of energy generated by central-station companies has doubled within five years. These facts have been interpreted in many quarters to mean that what appears to be a steadily rising geometrical ratio will require an unending development of new power resources.

In this entirely justifiable enthusiasm, however, sight has been quite lost of the fact that the largest contributing factor to this tremendous growth has been the addition of new customers, and that this addition represents a large part of a potential load whose limits are definitely circumscribed. The ultimate goal or saturation point in this direction lies in making a lighting customer of every family, store and office building; that for manufacturing power comprises the complete electrification of every industry. Once these ideals are attained, future growth will depend upon the increase in population, upon the volume of factory employment, upon the continued development of new electrical processes, and upon the enlargement of the uses for electrical energy.

To show the part played and the significance of this rapid acquisition of new customers the accompanying statistics have been gathered for the central stations of New York State and form the basis of an interesting analysis which leads to some very unexpected conclusions.

TABLE I—ACTUAL ELECTRIFICATION OF NEW YORK STATE—THE LIGHTING LOAD

Year	Population of State	Total Possible Customers	Per Cent Increase Over 1909	Actual Customers	Per Cent Increase Over 1909	Per Cent Electrification Attained
1909	8,965,000	2,240,000	....	230,000	...	10.3
1914	9,665,000	2,440,000	9.0	595,000	158	24.4
1919	10,270,000	2,650,000	18.3	960,000	317	36.2
1923	10,700,000	2,820,000	25.9	1,750,000	661	62.0
1924	10,800,000	2,880,000	28.6	2,030,000	783	70.5

Table I has been developed from the census and the Public Service Commission statistics for the state as a whole. To the indicated number of families, found by dividing the population by factors ranging from 4.5 in 1909 to 4.15 in 1924, there has been added the estimated number of commercial establishments, stores, office buildings, etc. This number has been taken at two and a half for every hundred persons. Although a little small for Manhattan Island and a little large for the rest of the state, it is nevertheless in line with various reports on urban population. The "actual customers" are the average number of lighting meters in service each year as derived from the reports of the central-station companies. The figures for 1924 are based upon developments to date.

It will be noted that during the last decade 46.1 per cent of the total possible business has been added to the central stations' lighting load and that the number of customers has increased 783 per cent over 1909, while the total number of possible customers has grown only 28.6 per cent.

TABLE II—ACTUAL ELECTRIFICATION OF NEW YORK STATE—THE POWER LOAD

Year	Total Installed Hp.	Hp. per Capita	Per Cent Increase Installed Hp. Over 1909	Hp. Electrified and Operating on Purchased Power	Per Cent Increase Over 1909	Per Cent Electrification Attained
1909	1,997,000	0.22	....	389,945	...	19.5
1914	2,356,655	0.24	18.0	644,824	65	27.4
1919	2,936,530	0.29	47.1	1,170,977	200	40.0
1923	3,220,000	0.30	61.4	1,740,000	347	54.0
1924	3,295,000	0.31	64.8	1,890,000	384	57.4

The same tendencies are visible in the records of the power load, as exemplified by the electrification of factory machinery.

The figures in Table II for 1909, 1914 and 1919 have been taken from the United States Census reports. Since 1919, however, there has been a slackening in the installation of new machinery, manufacturing conditions still largely reflecting the effects of the great war-time industrial developments. Until demand once more overtakes the productive capacity of the present mills, enlarged as they were to meet the heavy requirements of the war, a much slower growth of installed machinery is indicated. For the purpose of an estimate the pre-war rate of growth has been assumed. In the ten-year period from 1919 to 1929 this would be 24½ per cent of the 1919 figure. Even this appears to be high, when compared with the 20 per cent figure estimated by the "New England Power Report."

On the other hand, the increase in the connected motor load, as actually reported by the central-station companies, has been tremendous. In the four years from 1919 to 1923 this grew approximately 46½ per cent in the Greater New York zone and 50 per cent in the remainder of the state. It is on this basis that the last two lines of Table II have been estimated. Of the

total power in the state, as reported by the census, more than 300,000 hp. is still in private water power and at least 250,000 hp. is in private steam and gas-engine plants of large and economical installations which are not likely immediately to be displaced by purchased power. Eliminating these, it becomes evident that there remains available about 850,000 hp. still capable of electrification by purchased power and that 69 per cent of the probable business is already on the electric company's books.

The obvious fact that this outstanding progress in the acquisition of new business cannot be kept up indefinitely emphasizes the need for increased activity in building up the load among the present consumers if the rate of growth of the electric industry is to be maintained.

Fig. 1 shows some striking similarities. Note the regular coincidence during the years of normal business prosperity between the theoretical curve of the 9 per cent annual increase and the actual sales of electricity and their proportionate divergence during the fat and lean years. Note also the parallels between this 9 per cent curve and those of the percentage of possible loads attained by the central stations.

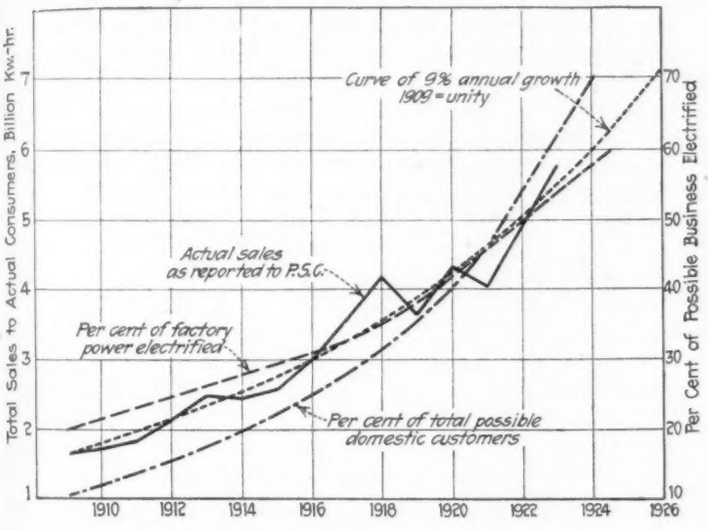


FIG. 1—CURVES SHOWING COMPARISON OF THEORETICAL GROWTH OF INCREASED USE OF ELECTRICITY WITH ACTUAL RECORDED SALES

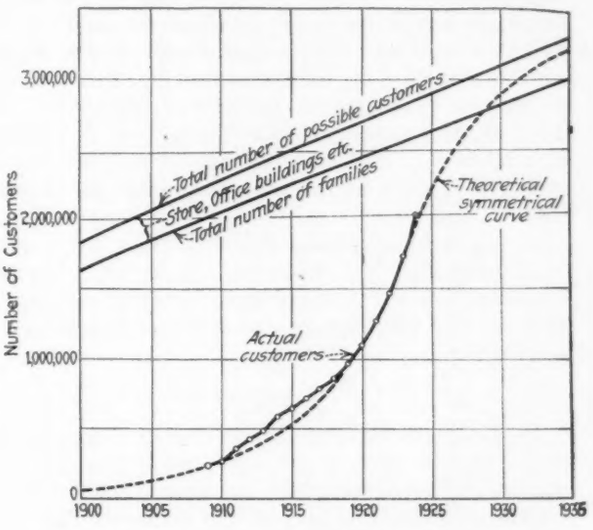


FIG. 2—ACTUAL AND TOTAL POSSIBLE RESIDENTIAL AND COMMERCIAL CUSTOMERS IN NEW YORK STATE

The curves shown in Fig. 1 do not include intercompany sales or the operations of the Lawrence River Power Company.

How Much Is the Lighting Load Increasing?

This classification is called "commercial lighting" (both metered and flat rate) in the reports to the Public Service Commission and embraces all domestic and commercial uses for light, appliances, cooking and for incidental small power not sufficient to take the wholesale power rates. The relation between the total possible consumers and those actually on the books is further exemplified by Fig. 2, which shows the average number of meters in service each year. The "theoretical curve" is a symmetrical one, starting at zero in 1882 and assumed to be asymptotic in 1935 to the line of the total number of possible customers.

While great numbers of new accounts have been added each year in progressive ratio to the central stations' load, the average use of electricity per customer has shown comparatively little change. Table III shows the total sales, revenue and average price for "commercial lighting," as defined above, for New York State outside of Greater New York City. The corresponding figures for the city are not available because it is only recently that similar rate classifications have been established in the reports to the commission. Those for the rest of the state, however, tell the story in a graphic manner.

This table is the sum total of lighting by every company and municipal plant, large and small, operating in New York State outside of Greater New York. Columns (5) and (6) are obtained by dividing (3) and (4) respectively by (2). Column (7) is the over-all average for this entire territory and is found by dividing (4) by (3).

It has long been evident that the use of electricity for lighting purposes has been shrinking because of the increasing efficiency in electric lamps and the virtual disappearance of the old energy-consuming carbon filaments. Again, in 1910, electricity was still more or less of a luxury and its use confined to the well-to-do to a larger extent than prevails at present. Now it has become a universal necessity, and its use is modified by the rigors of the average household budget.

On the other hand, a favorable factor has been the development of the appliance load, which has not only counteracted the shrinkage in lighting but also has raised the average use per meter from 507 kw.-hr. per year in 1915 to 632 kw.-hr. in 1923. This increase of 15 kw.-hr. per year per consumer speaks most highly for the efforts of the merchandising departments of the central-station companies. At the same time, it must again be emphasized that it is only through the utmost diligence on the part of the commercial departments that a steady growth at this rate can be maintained.

How Is the Power Being Used?

A factor which is frequently overlooked in the preparation of "power surveys" is the influence of the hours of industrial employment. These have shown a steady decrease for many years. In several cases this has been the direct result of legislation; in all instances it is the outcome of the present-day ideal of decreased work at

TABLE III—"COMMERCIAL LIGHTING" IN NEW YORK STATE OUTSIDE OF GREATER NEW YORK

Year	Consumers	Kw.-Hr. Sold, Millions	Revenue, $1,000	Average Sales per Meter Kw.-Hr.	Average Sales per Meter Amount	Average Price per Kw.-Hr., Cents
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1910	125,000	90	6,400	720	$51.10	7.12
1911	166,000	100	7,400	602	44.58	7.40
1912	198,000	109	8,500	550	42.95	7.80
1913	218,000	122	8,800	560	40.40	7.21
1914	251,000	138	9,500	550	37.85	6.88
1915	296,000	150	10,400	507	35.15	6.94
1916	337,000	173	11,800	513	35.00	6.81
1917	377,000	200	13,300	531	35.30	6.65
1918	411,000	224	14,000	545	34.10	6.25
1919	453,000	260	16,800	574	37.10	6.46
1920	525,000	310	19,500	590	37.15	6.30
1921	604,000	340	22,500	566	37.25	6.62
1922	666,000	405	26,500	607	39.80	6.55
1923	780,000	492	31,500	632	40.40	6.41

increased pay. It is only rarely that it has been compensated for by increased employment, and the net result is a decrease in the load factor of the machinery of the plant. This is illustrated by Table IV, which shows the performance of factory machinery in New York State outside of New York City, Niagara Falls and Massena. The two last-named places could not be included because of the influence of the electrochemical load.

It will be noticed that, although much more electrified machinery has been installed, the average use of each machine is slowly decreasing in almost the same proportion as the decrease in the average hours of weekly employment.

CONCLUSIONS

It is evident from the foregoing tabulations that the preponderant part of the increase in the use of electricity in New York State has arisen, not from greater consumption on the part of the user, but from the enlargement of the number of users. It is also evident that as the limits to the total possible number of users are approached the annual additions of new accounts to the central-stations' books must begin and will continue to decline.

This does not indicate any radical revision in future plans for the industry; but it does mean that if the curve of actual sales is to continue to coincide with the progressively steepening curve of the 9 per cent annual increase, a continued stimulation of individual use must be undertaken, that the farm load must be sought after and diligently encouraged, that the huge potential market of the domestic appliance load must be energetically developed, that further labor-saving machinery must be installed and that new and attractive uses for electricity must be worked up.

TABLE IV—PERFORMANCE OF FACTORY MACHINERY
(New York State Outside of Greater New York, Niagara Falls and Massena)

	1909	1919	Per Cent Increase
Total machinery installed (U. S. Census)	1,473,032	2,157,634	47
Average number of employees (U. S. Census)	442,000	573,000	30
Hp. installed machinery per employee	3.34	3.77	13
Average hours of labor per week (U. S. Census)	57	51	—10½
Average hours of indicated "work year"*	2,790	2,500	—10½
Hp.-hours per year per employee	9,310	9,425	+1
Total machinery electrified on purchased power, hp.	200,000	760,000	280
Actual electricity used (P. S. Comm.), kw.-hr.	295,000,000	1,047,000,000	255
Indicated average load factor, per cent	22.8	21.2	—7

* Average hours per week times forty-nine weeks.

The Catawba River Development

How Hydro-Electric Power Is Utilized in the Carolinas to Supply a Large Group of Textile Industries—Operating Conditions

A FEW years has witnessed the growth of a mammoth textile industry along the lines of the Southern Railway System in the Carolinas. Not the least potent factor in bringing this about has been the development of electric power in that region. There are today about four hundred spinning and weaving mills along the 2,500 miles of high-tension lines of the Southern Power Company, containing 8,000,000 spindles as compared with a total in the United States of 37,761,000.

The heart of the electrical system is the hydro-electric development along the Catawba River. With an available drop from the pool at Bridgewater to the tailrace at Wateree (see illustration) of 1,058 ft., a distance of about 200 miles by river, existing plants and those under construction utilize a total of 634 ft., as indicated in Table I, and develop a total kva. of 383,150 when running at full capacity. In addition there is a steam plant on the river at Mount Holly (45,500 kva), bringing the total kva. installed on the river to 428,650. The total steam and hydro-electric kva. on the Southern Power Company's lines and in process of construction is 535,900, of which 130,250 is in steam stations.

TABLE I—DEVELOPMENTS ON THE CATAWBA

Station	Head, Ft.	Kva. Installed
Bridgewater	135	25,000
Rhodhiss (under construction)	60	30,000
Lookout Shoals	76	22,800
Mountain Island	82	75,000
Catawba	25	6,600
Fishing Creek	50	37,500
Great Falls	70	30,000
Dearborn		56,250
Rocky Creek	64	30,000
Wateree	72	70,000
Total	634	383,150

Thus the Catawba River is a remarkable power source, but perhaps the most unusual thing about the development is the use of dams and pools to change it from a river with a twenty-four-hour flow period to one with a fifteen-hour or sixteen-hour flow period. This is done by adding to the storage in the pools during the nights and the week ends as the load on the system is then very much less than during the daylight hours of the weekdays. In addition, seasonal conditions of rainfall are utilized to the fullest extent.

In the operation of the system steam stations are used only to supplement the water power on the river and are operated for the minimum number of hours consistent with a scheduled water control. In a somewhat similar manner energy is obtained from or given to adjacent systems, depending upon their needs and the water conditions. As a normal operating principle the transmission system is divided into four principal segregated parts and the lightest possible interconnection is maintained between these parts. In some cases separated machines in same plant are used to supply separate lines, but in general a whole plant or group of plants is assigned to each zone. This general principle of sectionalization has been found to enhance operating reliability.

On the Catawba River at the headwaters is a pool, 12 square miles in area, at Bridgewater, which is the controlling element in the operation of the river plants.

Not considering the local plant at the pool, storage capacity of 100,000,000 kw.-hr. is provided. This pool is scheduled to be filled by Sept. 1 each year and is then pulled down until by Jan. 1 it becomes practically empty. Only general principles apply to the water flow, because heavy rains or seasonal variations affect results, so that operations are guided best by hourly reports from each pool; but the general principle is maintained that Bridgewater pool should be filled by the early fall.

Below Bridgewater is a pool at Lookout Shoals which works on a weekly basis. During the week water is used to an extent that allows none to flow over the pool spillway during the Saturday and Sunday filling periods. The same general conditions of weekly operations are applied to the pool at Mountain Island, where the pool level is lowered during the week as much as 15 ft., depending on the time of the year and load and weather conditions. As water is needed at the lower plants the Mountain Island pool is drained.

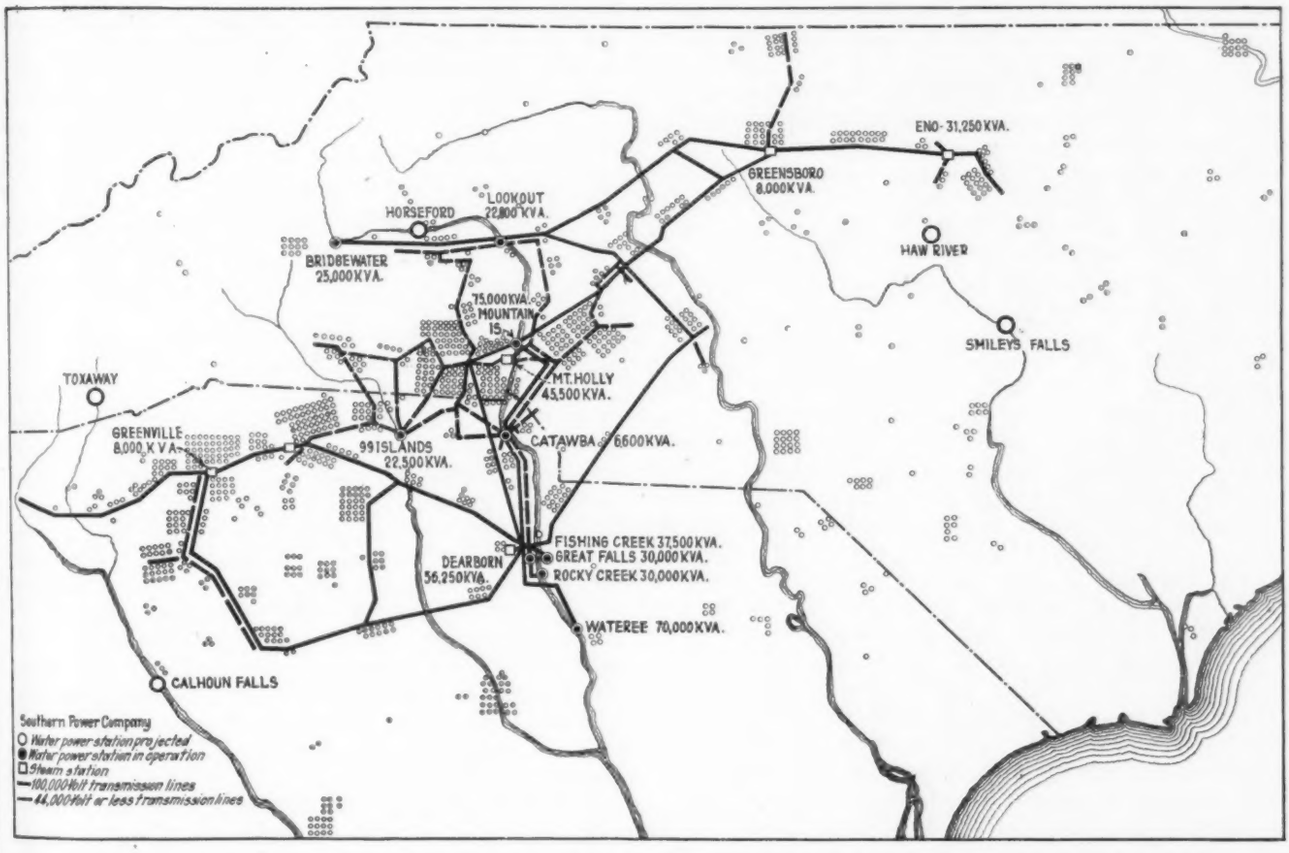
The Catawba plant is small and attempts to utilize all the available water by running day and night at full load. But at Fishing Creek there is a large pool which is operated on a weekly basis—i.e., water is drawn during the week and the pool is allowed to fill up again on the Saturday and Sunday. This operation governs the operation of the Great Falls station also.

The small station at Rocky Creek operates at full load continuously, and the pool at the station is pulled down during the night and fills during the day when the other stations operate. At the Wateree station there is a large pool which may be pulled down as much as 8 ft. to carry the load, depending on the time of the year. The dam at Wateree is to be raised about 6 ft., giving a still larger pool for storage of water. At the new station at Rhodhiss there will be a small pool which will be operated on a weekly basis in the same way as that at Lookout Shoals.

Thus an attempt is made to waste no water under any circumstances and yet to use water power the maximum number of hours. The pools give opportunity for storing the normal river flow in a way to utilize it when full load is on the system. Rainstorms also fill the upper pools, and at no time is there much opportunity for water to escape over any spillway on the river. The hourly reports from all stations as to load and water levels enable the system-operating executives to keep every plant under control and to adjust conditions on the river.

The flow of the Catawba River varies on an annual basis from 2,000 cu.ft. per second to 60,000 cu.ft. per second, so that the river-control system has to contend with a remarkable variation in flowage. Yet the river is now virtually harnessed, although the development of new sites will materially aid in controlling the water.

Table II gives the principal pool storage capacities



TRANSMISSION SYSTEM AND GENERATING STATIONS OF THE SOUTHERN POWER COMPANY AND LOCATION OF THE TEXTILE INDUSTRIES IN NORTH AND SOUTH CAROLINA

Each small circle on the map represents 10,000 cotton spindles.

TABLE II—POOLS AND STORAGE CAPACITY

Name	Capacity, Kw.-Hr.
Bridgewater	100,000,000
Lookout Shoals	4,600,000
Mountain Island	10,000,000
Fishing Creek	3,300,000
Wateree	7,000,000
Rhodhiss (under construction)	12,000,000

based on the level of the top of the spillways, and the map shows the location of the cotton mills and the 100,000-volt and 44,000-volt power lines which supplied over a billion kilowatt-hours to consumers during 1923. Each small circle on the map represents 10,000 cotton spindles.

Letters from Our Readers

A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute

Determination of Pole Sizes

To the Editors of the ELECTRICAL WORLD:

The article by J. Howard Mathews on "Determination of Pole Sizes," published in the June 7, 1924, issue of the ELECTRICAL WORLD, is an interesting approach to one phase involved in the specification of poles. The method of Mr. Mathews differs somewhat from that contained in the Safety Code as published by the Bureau of Standards, where the determination of pole strength is a function of pole diameter at the ground line. This is, of course, not the correct way to do it, and Mr. Mathews' solution is based upon failure at the point where the diameter of the pole is one and one-half times the diameter at the point at which the load is applied.

A general criticism of the paper can be based only on the necessity for such refinement in calculation. There is a decided question in my mind as to whether or not the original strength of the pole is of serious moment. The critical strength, and the one in which we are most interested, is the depreciated strength of the pole at which it should be renewed, and, of course, both theoretically and in practice this is a function of the depreciated ground-line diameter, where the strength of the pole decreases most rapidly.

Still another important factor is the question as to whether or not individual pole strengths indicate the strength of a pole line. I personally have never been able to subscribe to this. While it is true that most of the major pole failures have been transverse failures, usually due to sleet and wind, they have in a great majority of cases occurred under conditions which are unusually severe, and to guard against such failures would increase the cost of line construction to a point which would make it prohibitive. The extent of the frontage of a gust of wind is very limited, and when a line is in a long tangent and does vibrate because of transverse load it always assumes a wave motion, the sway in one direction counteracting the sway in the other. All of this tends to show that we know little or nothing about the strength of pole lines, and that too much stress should not be placed on the calculated strength of a pole line as indicated by the strength of individual poles. However, special parts of pole lines should be analyzed, such as those at railroad crossings and crossings over signal lines, at which locations the crossing poles should be individually studied. Under these circumstances the plan outlined by Mr. Mathews would be of material benefit in cutting down the amount of work.

The problem of selecting the proper-size pole for the individual location is a most serious one. When one realizes that the age of the pole is from ten to twenty-five years, depending upon whether it is treated or untreated, it can easily be foreseen that to forecast the load it will be carrying five to twenty years after it is set is extremely difficult.

Many of the arguments favoring the selection of poles for specific conditions which are mentioned as a class by Mr. Mathews have also been used by the Bureau of Standards in justifying the Safety Code, and an analysis of each specific case where it has been claimed that the wrong size of pole was used usually indicated that the heavy loading of that particular pole had been applied only at a very recent date.

I have always been an advocate of the purchase of poles by quality plus a ground-line diameter without any particular regard to the top diameter. In other words, if we can obtain enough timber at the top of the pole so that the cross-arms can be framed and still provide sufficient mechanical strength, we are interested only in its diameter at the ground line, at which point the pole will eventually fail. Such a selection of poles must be applied intelligently, however, because where heavy weights are to be supported, such as transformers, a rugged pole must be used. X. Y. Z.

New York Edison Company's Financing

To the Editors of the ELECTRICAL WORLD:

Your issue of May 10 last contains an article entitled "The Financial Structure of Power and Light Companies," by Alfred L. Loomis. Item one in the table which is part of the article purports to give the pertinent figures in relation to the affairs of the New York Edison Company for the year 1923, the figures being the combined results of the operations of the New York Edison Company and its affiliated company, the United Electric Light & Power Company. In preparing a consolidated income report of this nature it is apparent that many eliminations of intercompany transactions are necessary in order that the consolidated report should be based upon the amount of revenue received by the consolidated companies from the public and the actual outgo in the form of expenses, intercompany charges being eliminated from the joint operating costs. No statement of this nature could probably be accurately made except in the office of the companies affected, and we presume it is due to this fact that the author of the statement was led into error.

In the table referred to above the net earnings of the New York Edison Company's system were given as $25,431,000, whereas the correct amount is $20,211,974. In the table the interest is stated as $10,931,000, whereas the correct amount is $4,159,984. The table states that the interest was earned 2.3 times, whereas the correct figure is 4.9 times.

In a footnote attached to the table the statement is made that the item "interest" includes rentals paid, but the fact is that the rentals referred to in the New York Edison figures, consisting of rentals of subway ducts and buildings occupied for various purposes in connection with the operations of the companies, are a part of the cost of operation and are not properly includable, therefore, as interest on money borrowed—in other words, fixed charges. It is apparent that the method adopted by the author of the table distorts the relation between corporate income and fixed charges and adversely affects the showing as to the margin of financial safety, a most important factor in the sale of long-term debt securities. H. M. EDWARDS,
Auditor.

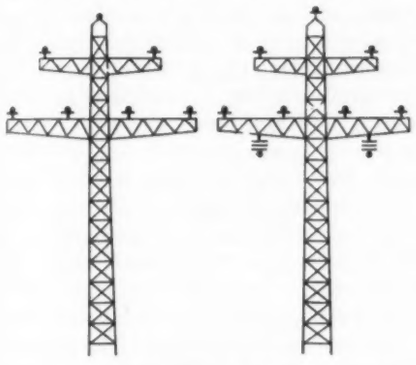
New York Edison Company,
New York, N. Y.

Central Station and Industrial Practice

Installation, Operation, Maintenance, Test and Repair of Generation and Distribution Equipment, and Methods of Economically Utilizing Electric Service in Large Industrial Plants

Two-Circuit Pole Adapted to Three Circuits

EMERGENCY expedients should always be distinguished from good practice, and this applies to the method described below. A company had two three-phase circuits supported on pin insulators on the cross-arms of a latticed-steel pole line, as shown in the acompanying



THREE CIRCUITS ACCOMMODATED ON TWO-CIRCUIT POLE WITHOUT ADDING OR CHANGING CROSS-ARMS

illustration. The load had grown to the point where another circuit was required, but the investment in a new pole line was not looked upon with favor. Since the existing pole line as well as cross-arms had a very high factor of safety, ways of utilizing the existing pole to accommodate another circuit were investigated. The method finally adopted provided for the additional circuit without reducing clearances or sacrificing symmetry of circuits and required only the attachment of one pin insulator and two suspension insulators per pole. Space for the pin insulator was provided by removing the ground wire on the peak of the pole, and the two suspension insulators were hung from the lower cross-arm at points midway between the original pin insulators attached to them.

The only things that were sacrificed were the ground wire and a part of the safety factor in the lower cross-arm and pole. However, the load on the lower cross-arm as well as that on the pole was increased only 50 per cent, and, as previously explained, the pole was designed for a very high factor of safety; so that in this emergency the disadvantages of the expedient could be accepted without any misgivings.

Calculating Losses on a Transmission System

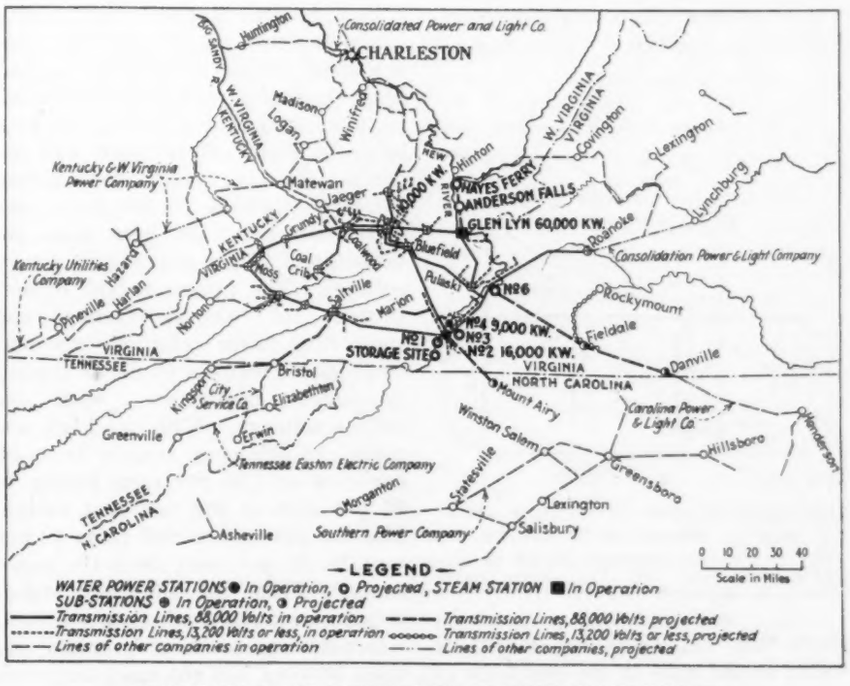
THE Appalachian Power Company recently made a study of the losses on its transmission system, which is shown on the accompanying map. These losses were computed for a period covering November 25 to December 26, 1923. The figures given in Table I show the results obtained.

Meter readings were used for most of the data, but the transformer losses were determined by using design data, the hours of service and the load factor. The core-loss values were determined by multiplying the core loss of each transformer by the hours it was in service. The copper losses were determined by dividing each day into three eight-hour periods and then using resistance values and the average load for each of the periods. This was done on about twelve power transformers to determine data for a representative curve plotted between load factor and per cent copper loss. This curve was then applied to all other installations having different load factors.

In the case of old transformers the effect of iron aging was considered as this may increase the core-loss

TABLE I—TRANSMISSION LINE LOSSES

	Kw.-Hr.
Total energy generated	20,114,840
Energy used in stations and distributed at low tension from stations	5,884,400
Energy delivered to high-tension step-up stations	14,230,440
Energy received at low-tension side of substations	12,621,900
High-tension transmission and transformer losses	1,608,540
High-tension transformer losses	654,740
High-tension line loss	953,800
Total energy billed	16,663,303
Total energy used by company	424,360
Total accounted for	17,087,663
Losses, total generated less total accounted for	3,027,177



DEVELOPMENT AND POSSIBILITIES OF INTERCONNECTION IN SOUTH ATLANTIC STATES

TABLE II—CLASSIFIED LOSSES IN TRANSMISSION SYSTEM

	Losses, Kw.-Hr.	Per Cent of Generated Energy	Per Cent of Total Losses
High-tension transmission	953,500	4.74	31.5
High-tension transformers	654,740	3.26	21.6
13,000-volt transmission	510,159	2.54	16.8
13,000-volt transformers	414,260	2.60	13.7
Conversion losses and distribution: Losses for direct-current mine service	366,480	1.82	12.2
Small-town 2,300-volt distribution	127,738	0.64	4.2
Total	3,027,177	15.06	100
Energy used at company stations	424,360	2.11	....

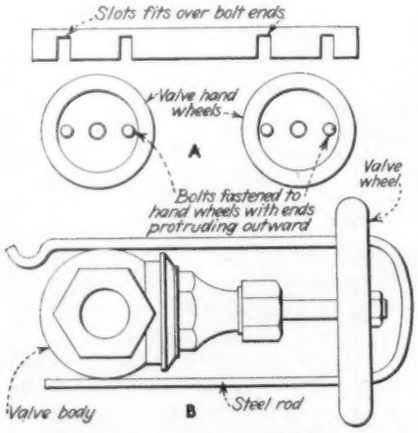
Per cent energy billed to energy generated = 82.84

value 25 per cent in twelve years on older designs. For a small amount of distribution at 2,300 volts the losses were estimated at 12 per cent of the energy billed.

Table II of classified losses shows some interesting figures. These data were computed on each circuit and for the whole system and are reliable indicators of load conditions as well as determining changes in line and transformer layout or capacity.

Guarding Against Accidental Valve Operation

SOME valves are provided in power plants which must be operated in emergencies but operation of which during normal times would be detrimental to service. For example,



DEVICES EMPLOYED TO PREVENT ACCIDENTAL OPERATION OF VALVES

(a) For valves admitting water to generator end bells; (b) for single valves adapted to this type.

there may be valves for admitting water to the coils in the end bells of generators to suppress fire. When they must be operated there must be no impediment present. On the other hand, they must be protected against accidental or thoughtless operation.

To provide such requirements the Memphis Power & Light Company uses several methods of precaution, depending on the adaptability of the scheme. On the handwheels of the two valves which admit water to the end bells of the generators bolts are attached at diametrically opposite points so that they will be in a straight line. Over their projecting ends is slipped a piece of strap iron with slots that accommodate the bolt ends. This device can be readily knocked off when the valves must be operated, but warns against and prevents accidental operation.

On other valves of the character previously mentioned, which have open handwheels, a U-shaped rod with one end bent over slightly is slipped through the handwheel and snapped over the valve casing.

Rhode Island Utilities Report Good Results from Pulverized Coal

SUCCESSFUL use of pulverized coal in the two largest utility plant boiler houses in Rhode Island was reported at a recent meeting of the Providence Engineering Society by E. H. Couch, combustion engineer for the Narragansett Electric Lighting Company, and W. C. Slade, superintendent power and lines, United Electric Railways. Mr. Couch pointed out that early tests with Illinois coal spread the erroneous impression that coal with as high as 8 per cent moisture could be handled properly without drying. The surface moisture is the important factor and should not exceed 3 per cent. The high inherent moisture of some Western coals accounts for successful operation with 8 per cent total moisture. In general, dryers are a necessity.

In the Narragansett trial installation burners of the Lopulco type are used in an air-cooled furnace. Slag formation has been prevented by placing a water screen of 4-in. tubes in front of the back wall opposite the burners. Combustion rates as high as 39,000 B.t.u. per cubic foot per hour have been obtained, and 17 per cent CO_2 has been secured. The proper height of setting is not fully determined, and some runs favor relatively low settings, there being a tendency toward incomplete combustion with the higher settings. With the high settings the efficiency ranged from 80 per cent at 150 per cent rating to 76 per cent at 250 per cent rating. The dry gas loss varied from 12 per cent to 13 per cent over the same range. From the efficiency standpoint, powdered coal shows a considerable improvement over the old short stokers, but not much improvement at steady loads over the improved stoker. With variable loads there is a decided saving in banking. The use of powdered coal is more flexible and permits closer adjustment of the coal-air ratio. The disadvantages of powdered coal are higher first cost, greater depreciation and slightly more risk of breakdown. By and large, powdered coal appears a slightly better fuel for base loads and a much better fuel for fluctuating loads. The present Narragansett powdered-coal boilers were formerly stoker-fired units of 6,000 sq.ft. heating surface. The first furnaces built had a combustion volume of 6,150 cu.ft. and the second furnaces one of 5,206 cu.ft.

RESULTS AT MANCHESTER STREET

In the railway plant provision has been made for future change-over to fuel oil if desirable. The decision to install pulverized-coal equipment was based largely on the higher efficiency obtainable under test and operation. This differential between test and operating efficiencies is only about 3 per cent with pulverized coal against 5 per cent with stokers, and recent improvements in stokers have cut down this lead. Mr. Slade said that with pulverized coal it is easy to operate with from 20 per cent to 25 per cent excess air, and as low as 12 per cent or 15 per cent may be reached.

The problem in this case was to rebuild an old boiler plant to obtain the maximum peak load capacity from a given building volume. Pulverized coal offered the possibility of continuous operation at 300 per cent of rating and operation at 400 per cent for two-hour periods. Eight stoker-fired boilers in two decks were replaced by four pulverized-coal boilers with a considerable increase in developed capacity.

The straight-inclined-tube, single-

pass type of boiler was selected. The heat absorption is good and the response to varying loads is rapid. A stone-cold boiler was put on the line in fifty minutes, and the brickwork stresses were the only limitation on the time. An idle but warm boiler was brought to a fair rate of steaming in twenty minutes without difficulty. By closing all flues and openings these boilers can be banked on the thermos-bottle principle. A boiler so banked at 205 lb. showed 15 lb. steam after twenty-four hours. The same boiler can be quickly cooled for repairs by opening all the flues. An air-cooled setting with a 9-in. inner wall was used and no greater thickness is necessary.

The foregoing construction greatly increased the life of the refractories, reducing outages to a minimum. Brick walls with fireclay joints give needed opportunity for expansion and contraction. The installation was figured for 14,000 B.t.u. coal, but can use any Southern or Pennsylvania coal worth shipping to New England. Early this year 12,000 tons of Rhode Island anthracite were successfully burned. The fine ash from the pulverized-coal stack is less objectionable than the clinker from stokers or the odor from oil.

There will probably be no saving in labor costs from the use of pulverized coal in this plant. Fewer men are required, but they must be more intelligent. The four boilers in the present installation have a total heating surface of 50,000 sq.ft. with a continuous rating of 300 per cent and a two-hour rating of 400 per cent. Each boiler is rated at 1,266 hp. with a combustion space of 10,000 cu.ft. The combustion space is 24 ft. 8 in. wide, 25 ft. 8 in. high above the screen and 17 ft. 3 in. deep.

Tests have recently been made, but the data have not yet been analyzed. At 150 per cent rating the flue gases leave the boiler at about 445 deg. and the economizer at about 230 deg. The corresponding figures at 311 per cent rating were 560 deg. and 310 deg. The draft loss at 200 per cent rating was about 0.5 in. through the boiler and 0.5 in. through the economizer. The average CO_2 is between 15 per cent and 16 per cent.

The total cost of rebuilding the boiler room is estimated at $800,000. Each boiler erected without its setting cost $37,000. Settings, steel casing, refractories and insulating brick total $28,000, and economizers, fans, breechings and flues total $31,000. The pulverized-coal equipment immediately chargeable to a given boiler cost $10,000, making the total cost of each boiler unit $106,000. The remaining pulverized coal equipment, piping, building changes, etc., bring the total cost to $200,000 per boiler. It is expected that the boiler efficiency without economizer will reach 80 per cent for all ratings between 100 and 300 per cent.

Overhead Distribution Construction

Standardized Practice as Developed and Used by the
WEST PENN POWER COMPANY, PITTSBURGH

Railroad and Telephone Crossings

THE general type of construction used by the West Penn company for crossings over railroads is shown in Fig. 62. Normally the crossing span should not exceed 150 ft., and the adjacent spans should not exceed one and one-half times the normal span of the line. The crossing poles should be side-guyed in each direction and guyed away from the crossing in the direction of the line. Where guying of crossing poles is impracticable, the guys may be placed within 500 ft. of the crossing, provided:

(a) The line between such guyed poles and the crossing shall be substantially in a straight line with the crossing poles.

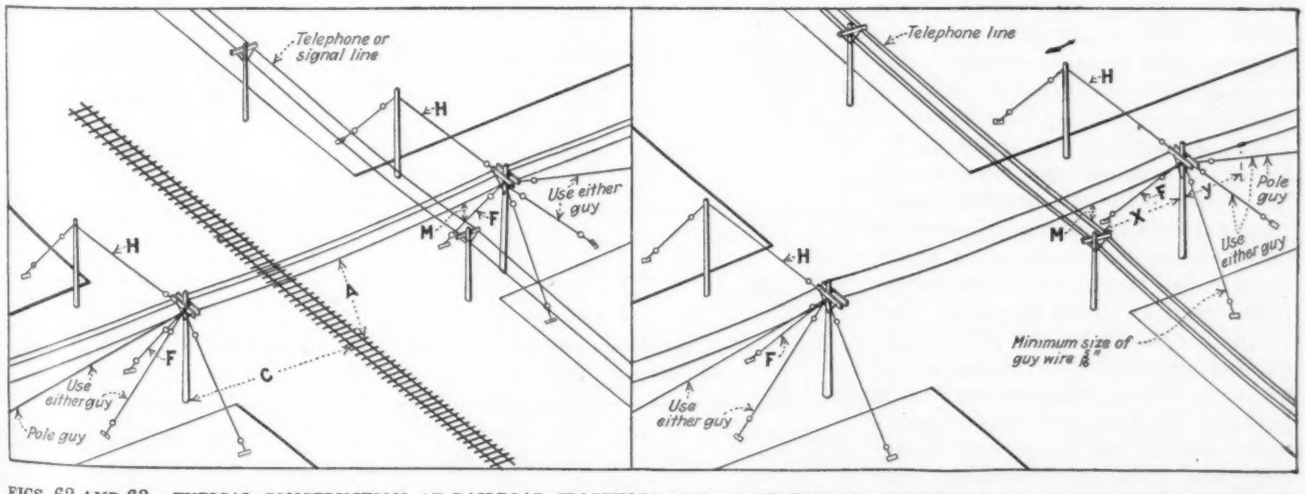
(b) The average length of span between the guyed poles and the crossing shall not be in excess of 150 ft.

(c) The head guy shall be run from each intervening pole back to the adjacent pole.

Conductors at railroad crossings shall have twice the normal sag shown in Table XI (see ELECTRICAL WORLD for March 29, 1924, page 630) and shall have the clearances shown in Table X and Fig. 35 (see ELECTRICAL WORLD for March 22, 1924, page 580).

The general type of construction used over telephone, telegraph or signal circuits is shown in Fig. 63. Normally guys shall be installed as shown. Side guys shall always be installed outside of corporate limits of boroughs and cities, and if they cannot be installed at the crossing pole, they may be placed within 500 ft. of the crossing as described above for railroad crossings.

Conductors of more than 5,000 volts at wire crossings shall have twice the normal sag given in Table X. Conductors at wire crossings shall have the clearances to other wires shown in Table IX and Fig. 34.



FIGS. 62 AND 63—TYPICAL CONSTRUCTION AT RAILROAD CROSSINGS AND AT TELEPHONE, TELEGRAPH OR SIGNAL CIRCUIT CROSSING

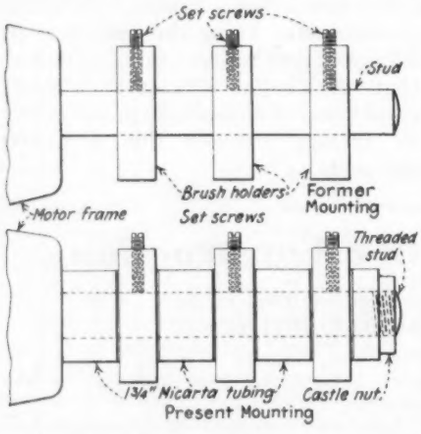
Fig. 62 (Left)—The minimum distance for *A* is 27 ft.; *C* 12-ft. minimum for main track and 7-ft. minimum for siding. No splices allowed in railroad crossing span, and wire must be No. 6 or larger. Side guy *F* should be used in preference to *H* where proper clearance can be obtained. The minimum for dimension *M* is 4 ft. for zero to 7,500 volts and 6 ft. for 7,500 volts to 15,000 volts.

Fig. 63 (Right)—The minimum for dimension *M* is 4 ft. for zero to 7,500 volts and 6 ft. for 7,500 volts to 15,000 volts. At crossings of individual twisted pairs, drop wires, service or other circuits of minor importance standard straight-line construction may be used. *A*, *C*, *F* and *H* are the same as for Fig. 62.

Lowering the Maintenance on Coal-Crushing Motors

BY C. B. KELLEY
Maintenance Foreman Kansas City Power & Light Company, Kansas City, Mo.

THE service required of a motor running a coal crusher for a central station is far more severe than that exacted of any of the other auxiliaries. The constant grind and chatter of the crushers transmitted back to the motor is so great that frequent inspection and overhauling must be given to it if continuous and efficient operation is to be kept up.



COMPRESSED TUBING PREVENTS BRUSHES COMING IN CONTACT

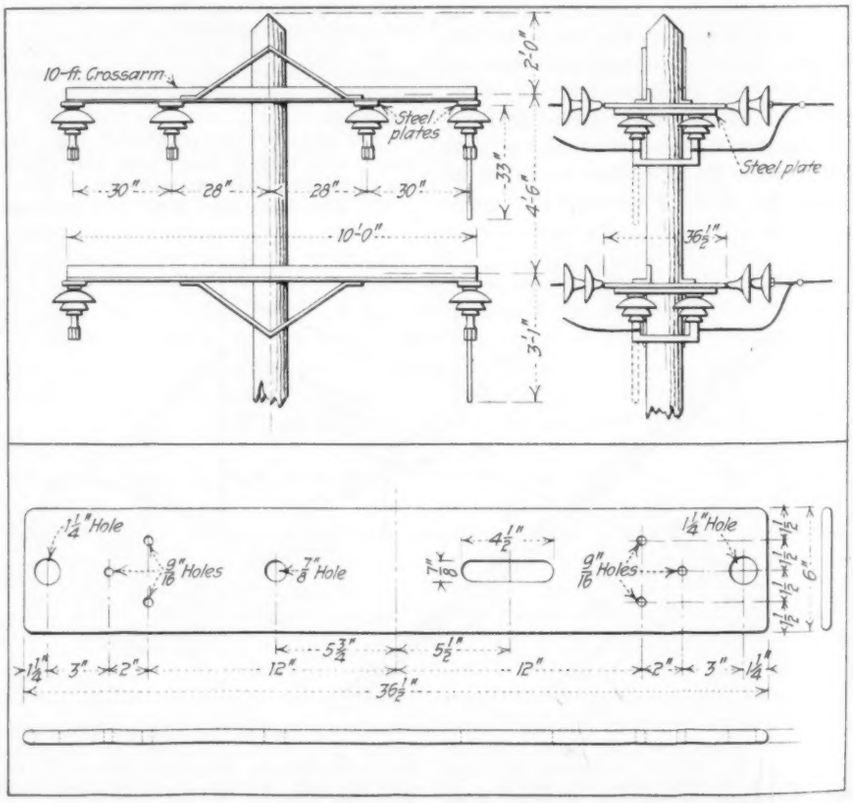
One of the most serious troubles with slip-ring induction motors, used with this class of work, has been that the vibration of the crusher loosens the set screws holding the brushes, thereby allowing the brushes to swing together and causing a short circuit. This is particularly annoying because the motor is usually mounted in an inaccessible place, which makes it hard for a maintenance man to make repairs.

To prevent the brushes swinging together, the Kansas City Power & Light Company is now inserting between the brush holders micarta tubing which holds the brushes apart, the brushes and tubing being under compression by means of a castle nut screwed on the end of the brush-holder stud, as shown herewith. The tubing for the 50-hp., 900-r.p.m. coal-crusher motor has a diameter of 1¾ in. The tubing serves as a spreader to keep the brushes separated even if the set screws should get loose. The set screws are still used in order to keep the brushes lined up properly and held firmly in place. About the only expense involved was the labor of threading the three studs for the brush holders and inserting the tubing, which took about sixteen hours. However, this expense was well worth while, since it has greatly lowered the maintenance and inspection requirements, which formerly necessitated an inspection every thirty hours.

Standardization Line of Construction

TO FACILITATE repairs on its distribution system the Blackstone Valley Gas & Electric Company, Pawtucket, R. I., is working out various standards for material and field methods, according to P. F. Hodgkins, formerly superintendent of distribution. The company follows N. E. L. A. practice in general, but deviates therefrom in some cases. Thus N. E. L. A. hard-pine crossarm sizes and pin spacings are used, but not the pinholes. All arms are drilled for $\frac{13}{16}$-in. pinholes in order that the wrought-iron pin used by the company on 2,300-volt circuits may be accommodated as well as a $\frac{3}{4}$-in. Lee pin used in 13,000-volt distribution. Instead of painting arms, these are dipped in a tank of "Barrett Carbasota" (A. T. & T. Company specifications) wood preservative at 170 deg. F. These arms are stacked outdoors to dry and are pinned at odd times. Chestnut poles will be used until the supply is exhausted or the price becomes prohibitive. Four different wooden arms have been standardized for both 2,300-volt and 13,000-volt distribution—(1) a six-pin standard arm, 8 ft. long; (2) a six-pin outrigged arm, 8 ft. long; (3) an eight-pin standard, 9 ft. 2 in. long, and (4) an eight-pin outrigged arm, 9 ft. 2 in. long.

The framing or gaining of poles for both 2,300-volt and 13,200-volt service has always presented a problem. Straightaway arms for 2,300 volts are spaced 24 in. apart on centers, this distance being increased to 30 in. for high-tension construction, with the gains cut 5 in. wide. On corners where the construction requires buck arms the company deviates from standard practice by increasing the pole height 5 ft, which enables the straightaway arms to be spaced 36 in. on centers, with the buck arm half way between. An advantage of this is better and safer working conditions for linemen, since the center of the top arm is 12½ in. from the top of the pole, the centers of the second and third arms being respectively 18 in. below the arm above. Still greater climbing space is also obtained in some cases by using the eight-pin arm for corners and leaving the pole pins vacant,



DEAD-END PLATE IS BOLTED TO THE UNDER SIDE OF DOUBLE ARM FOR POLES WITH DISCONNECTING SWITCH

this same corner spacing also being employed on high-tension work.

Cross-arm designations are: (A) top gain; (B) second gain; (C) third gain; (D) fourth gain. Pins are numbered 1, 2, etc., beginning from the street. The arc circuit takes the No. 1 pin position, A arm; single-phase lighting primaries take the five and six-pin position, and lighting secondaries take the two, three and five-pin position on the B arm. In rural districts where the company supplies only single-phase lighting and series street lamps, the single-phase primaries take the three and four-pin position, the three-wire secondaries take the two, three and five-pin position on the arm with a ground wire on a No. 312 pole iron 2 ft. below the arm. The series circuit takes the one and six-pin position.

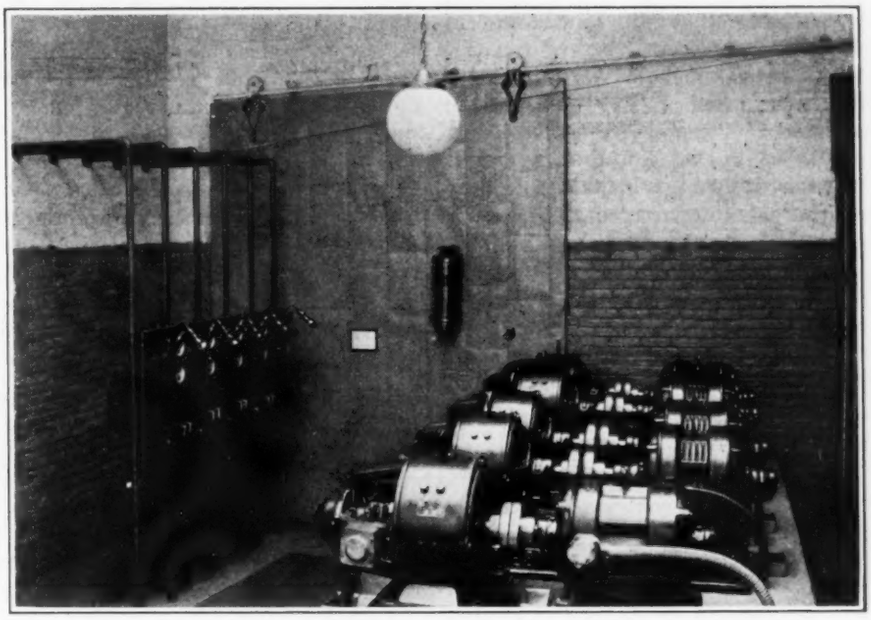
Fuses for transformers are generally placed on a cross-arm on the back of the transformer. While the porcelain block is used on nearly all transformers up to 30-kva. rating, the company is obliged to inspect these fuses frequently to give satisfactory service. Certain transformers in the business section are inspected monthly. In order to reduce the hazard of fuse inspection to the minimum and to eliminate temporary interruptions of service, two blocks are installed in multiple.

The inspector has only to insert an extra fuse plug, remove and inspect the working fuse, replace it if it shows signs of corrosion and resume service, withdrawing the substitute fuse. On all important installations for lighting and power D. & W. oil fuse cut-outs are used. These do not have to be inspected as often as the other type. To inspect this type, a porcelain fuse block is installed in multiple with the D. & W. fuse block, using a copper fuse plug temporarily while inspecting. Transformers are not banked as a rule, but where this is done sectionalizing fuses are installed between the units, using a weatherproof socket and a plug fuse. So far this practice has given no trouble.

The installation of disconnecting switches and pole-top switches required by the interconnection of circuits outside the station led to considerable annoyance until the engineering department devised a steel plate (shown herewith) which is bolted to the under side of double-arm construction, dead-ending the high-tension line with disk insulators to either end of the plate. The switch readily bolts to this plate, and this arrangement speeds up the replacement of defective switches at short notice.

Small-Unit Charging Sets for Electric Trucks

AN UNUSUAL installation of small motor-generator sets for charging its fleet of electric trucks has been built up by the Broadway Department Store in Los Angeles. Small charging sets were used rather than one large unit in order to keep down the first cost of the installation during the period when the number of trucks was being increased. The initial investment in battery-charging equipment was thus distributed over a long period of time. The outfit consists of five 10-kw., 250-volt motor-driven generators, each capable of charging two trucks at a time.



FULL AUTOMATIC BATTERY OF MOTOR-GENERATOR SETS FOR CHARGING ELECTRIC TRUCK BATTERIES

The equipment was manufactured by the Westinghouse Electric & Manufacturing Company and has full automatic features so that it does not require the supervision of an operator. Each unit is controlled from a conveniently located panel mounted in the same room. The control is so devised that a motor-generator can be started by merely pushing a button, after which the entire operation is automatic. In case of the failure of alternating-current power, a control relay on the panel disconnects the battery from the generator circuit. When the power is resumed, the set automatically starts up again and puts the battery on the line. As soon as the battery is fully charged it is automatically disconnected and the motor-generator stops, thus doing away with the services of an operator for anything other than connecting the leads to the batteries and starting up the generating apparatus.

The five machines are installed in a separate room in the garage and protected by fire doors from any dust and dirt from the main room of the garage. They are mounted on a raised concrete platform about 3½ ft. high, and are easily accessible for inspection or repair. This platform has been built to accommodate ten equipments, and conduits are run through the concrete for connection to that number.

The Broadway Department Store started out with its electric truck fleet two and a half years ago with two trucks and one charging set. The number of trucks has now been increased to eight 1-ton and two 2-ton trucks, and four charging sets have been added.

Service Interruptions Only Forty-five Minutes

IN THE ELECTRICAL WORLD for May 17, 1924, page 1008, it was stated in R. W. Callaway's article, "Diesel Engines for 200-Kw. Load for Small Town," that there had been only forty-five service interruptions since November, 1919. This should have read "Only forty-five minutes of interruptions."

Central Station Business

Advertising, Selling and Service Methods
Commercial Organization and Management, Customer and Trade Relations, Public and Financial Policies, and Reports of Company Plans and Experiences

Boston Edison Illuminating Engineering Division

TO FACILITATE the progress of commercial lighting activities on the system of the Edison Electric Illuminating Company of Boston, the illustrated organization diagram (Fig. 1) has recently received executive approval, and the working calendar reproduced in Fig. 2 has been adopted. Seventeen men are now employed in the illuminating engineering division, which is a branch of the sales department. The division is in charge of Julius Daniels, illuminating engineer. There are five section heads, and under two of these are grouped two sets of specialized activities which may in general be classified as technical and commercial. Two assistants under the principal engineering subordinate are provided, and six men report to the commercial chief.

The electric sign section is to cover the entire field of indoor and outdoor illuminated signs of all types. The sales promotion section consists of salesmen capable of making surveys and selling desirable lighting equipment for stores, offices, show windows, schools, municipal buildings, churches, industrial plants and residences. The special section will care for electric community shows, exhibits, demonstrations, etc., and will work in co-operation with the sales promotion or engineering sections. The engineering section will make more extensive surveys for the design of lighting installations and will prepare specifications when needed. The new building section will maintain contact with architects, builders, etc., with a view to the installation of good lighting in all new or remodeled buildings.

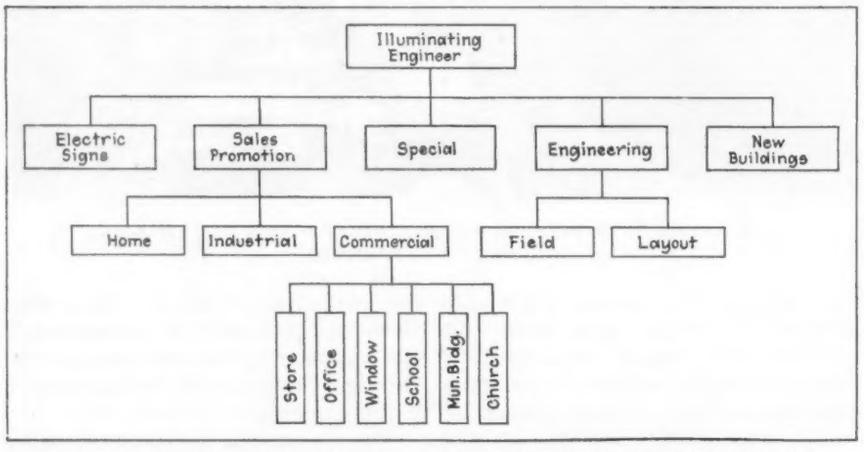


FIG. 1—SECTIONAL ORGANIZATION OF ILLUMINATING ENGINEERING DIVISION OF BOSTON EDISON COMPANY

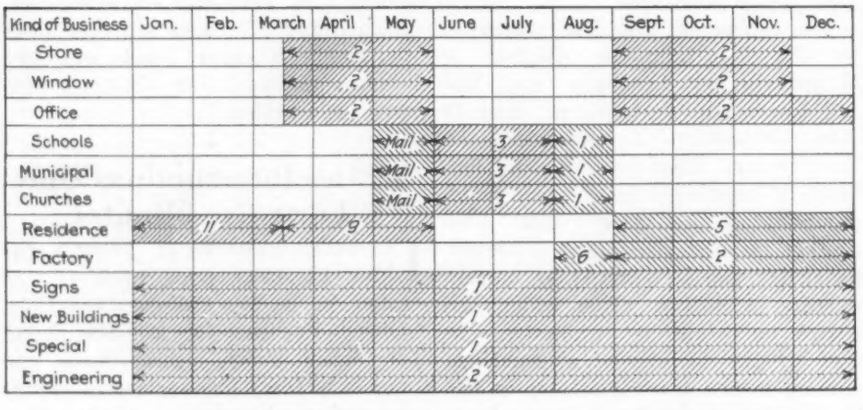


FIG. 2—LIGHTING CAMPAIGN CALENDAR AND NUMBER OF MEN SCHEDULED ON THIS WORK

Illinois Speakers' Bureau Addresses 11,617

FOLLOWING the plans made at the beginning of the year, the Public Service Speakers' Bureau of the Illinois Committee on Public Utility Information has organized the state into ten divisions in which public speakers have been furnished to address meetings of various kinds on subjects concerning the public utility business. Although this work has been going on only a short time, its success may be gaged from the total attendance of 11,617 people at 128 meetings held throughout the state during one month. It has been the aim of this bureau to have the utility men in each district so organized that they can on short notice make personal talks either to utility employees, at public meetings or in the schools. In addition to furnishing speakers in the various districts, the bureau is also prepared to supply speakers to meetings of state-wide importance and conventions of business men's associations.

It has been the bureau's experience that while people generally read the information appearing in the

SUMMARY OF ONE MONTH'S WORK OF ILLINOIS PUBLIC SERVICE SPEAKERS' BUREAU

District	Public Talks	Attendance	School Talks	Attendance	Plant Visits	Attendance	Employee Talks	Attendance
One	15	1,300	2	300	..	.....	16	720
Two	11	1,680	..	.....	4	200	4	305
Three	3	193	4	246	1	44	..	.....
Four	6	1,270	2	185	1	25	..	.....
Six	12	1,139	2	40	1	85	7	235
Seven	10	575	5	1,050	..	.....	..	.....
Eight	3	229	2	220	3	45	5	125
Nine	3	155	..	.....	15	745	1	35
Misc.	14	1,485	1	150	..	.....	..	.....
Totals.	77	8,026	18	2,191	25	1,144	33	1,420

Grand total of talks, 128. Aggregate audience, 11,617.

newspapers regarding utility operation, they are eager to attend meetings where a public utility man is going to speak and take the opportunity to ask questions about matters which they do not understand. Judging from the attendance and the interest displayed by the public, the Speakers' Bureau is reaching a number of people and answering many questions which could not well be done through general publicity.

Electric Ranges Used by 17 per Cent of Company's Residential Customers

By a Series of Campaigns a Central Station Has Put 5,486 Ranges on Its Lines—406 Sales Add $36,540 in Gross Annual Revenue

IN A SEVEN weeks' campaign that ended May 17 the Washington Water Power Company sold in Spokane and surrounding territory 406 electric ranges and water heaters, which will earn $36,540 in gross annual income. The company now has on its lines 5,486 range users, and still the point of saturation does not appear to be in sight.

At the start of this campaign 11 per cent of the company's residential consumers in Spokane were using electric ranges and water heaters, and the question "How many more can be sold?" might well have been asked. This was the problem that confronted the Washington Water Power Company.

Last year the company added 1,048 ranges and water heaters to its system, including Spokane and fifty-three towns served. The total number in service was about 5,000; that is, nearly 15 per cent of all the residential consumers had ranges. In some of the towns the range users constituted as high as 33 per cent of the number of consumers. Last year, out of the total of 1,048 ranges and water heaters actually sold, 75 per cent of the sales were made in two campaigns held during spring and summer.

Business in Spokane so far in 1924 had shown some improvement as compared with 1923, but in many of the towns conditions were not so good. In a general way it seemed reasonable that any campaign held at this time would not be nearly so effective as the two in 1923. However, a campaign on Westinghouse automatic electric ranges was planned, and with only a very small amount of introductory advertising it was launched on April 1, with the intention of running till May 17. Lewis A Lewis, sales manager; R. B. McElroy, assistant sales manager, and J. F. Farquhar, general agent, planned the campaign.

To make the sale effective, ranges must be installed promptly, and consequently an ample stock must be available at all times. Experience in previous campaigns showed that the rate of sales per week during a campaign may fluctuate through wide limits, say from twenty to eighty, and this fluctuation may depend upon apparently insignificant changes in local conditions, such as weather, holidays and other matters that affect prospective purchasers. The big question was "How many will be sold?" and the success of the campaign hinged upon the answer, as orders for the proper number must be placed in advance. A close estimate of probable sales was therefore made.

The advertising in Spokane was placed with three local newspapers, and during the seven weeks of the campaign 2,151 in. was used in thirty-one insertions. The advertising in the smaller towns was handled by thirty-seven newspapers, with an average of one insertion per week, 16 in. to 20 in. per insertion. An attractive insert, reproduced herewith, was mailed with every residential bill sent out during the campaign. In Spokane several handsome illuminated signs were installed upon the principal car lines, showing the range with the legend "My cook is a clock!" This sign also pictured the badge of the campaign, a pennant reading "$7.50 down."

As a special inducement, a four-piece "Cloverleaf" cooking set was offered free with each range, and the price quoted included range, water heater and complete installation.

The actual sales were effected by twenty-five district and local agents of the company and in Spokane by eight regular city salesmen, working in individual territories, and by the organization of the electric shop. A circular outlining the sale was issued on March 31 and is worth quoting because of its value in stimulating the activities of the sales force. It read:

> The record made last year during a similar sale places this department squarely up against a goal that can be crossed by 100 per cent team work. This means co-operation among the men on the firing line, in the store and by the company.
>
> The money spent for advertising is

ONE OF THE ILLUMINATED BILLBOARDS ADVERTISING ELECTRIC RANGE SALE

Manufacturer's Sale — April 1st to May 17th
Westinghouse Automatic Electric Range, Installed Complete With Water Heater
WHY STAY HOME TO COOK? The manufacturers of Westinghouse Automatic Electric Ranges now present to all our friends and customers a specialized opportunity to buy an electric range with water heater at an extremely small down-payment and a long time to pay the balance.
WHAT YOU GET AT $7.50 DOWN:
New model full automatic Westinghouse Electric Range, at decidedly reduced price.
All necessary range and water heater wiring.
Electric Water Heater.
Fiber-Form Tank Cover.
One 4-piece aluminum cooker set, Free
COMPLETELY INSTALLED READY TO USE AT $7.50 DOWN
THIS SET FREE
With every range purchased during this sale we give absolutely Free one of these $6 pure sheet aluminum Cloverleaf cooker sets—nest of three pieces—also covered kettle.
$7.50 DOWN
The Range with the Clock
Call, Phone or Write The Washington Water Power Company
"Cook by Wire—Instead of Fire"

INSERT INCLOSED WITH RESIDENTIAL BILLS

RESULTS OF WASHINGTON WATER POWER COMPANY'S ELECTRIC RANGE CAMPAIGN

	Spokane	Towns Directly Served by Company	Total
Population	115,000	55,000	170,000
Residential consumers	24,700	7,500	32,200
Westinghouse 3-19B ranges	231	111	342
Westinghouse 2-19B ranges	18	17	35
Westinghouse 5-15 ranges	.....	2	2
Other makes	10	17	27
Total sales, new ranges	259	147	406
Gross sales value			$92,862.25
Annual revenue, at $90			$36,540.00
Grand total in service	3,207	2,279	5,486
Percentage of residential consumers	13	30.2	17

for your benefit—to multiply your prospects, to eliminate sales resistance, to place you above any competition, to increase the proportion of sales to calls, and to insure you a welcome by every woman who appreciates the greatest household labor saver.

Every man has been assigned a man's size job to do, and when he performs his duty the company has authorized us to pay him for the extra time and effort required.

BONUSES AND PRIZES FOR SALESMEN

Fifty dollars for each salesman who makes quota. $1 per range sold by salesmen to be put in a pot and distributed weekly to the three salesmen who sell the most ranges that week. Distribution in the proportion of three-two-one.

Grand prize of $30 to the salesman who sells the most ranges during the campaign; second high salesman, $20.

Remember that real salesmanship starts when the customer says, "Not interested."

It is interesting to note that every one of the city salesmen made his quota. One man sold a total of forty ranges and won first prize for the campaign, and another took second prize with thirty-five ranges. These two salesmen received also a substantial share of the weekly pots. During the last week of the sale eighty-one ranges were sold in Spokane.

The results of the campaign, together with the value of the business in gross annual revenue, are shown in the accompanying tabulation.

Central-Station Stability a Good-Will Talking Point

THREE recent advertisements from newspapers published in New England cities served by electric utilities under the management of Charles H. Tenney & Company, Boston, emphasize the stability of the central station as a permanent community institution, pointing out that the fixed location, merchandising responsibilities and local interests of such an organization are real assets to the districts occupied. The advertisement from the Concord (N. H.) Electric Company shows that it is out of the question for a central station to play the part of a "fly-by-night" concern and asks for suggestions about improving service. The Haverhill company tells about its appliance-testing policy, and the Fitchburg company outlines its duties as a business house. Cyrus Barnes is general sales manager of the Tenney companies.

What Other Companies Are Doing

Medford, Ore.—The California-Oregon Power Company has ordered a carload of electric ranges, which will be distributed from the company's headquarters at Medford, Ore., to the dealers in southern Oregon and northern California who are co-operating with the company in range merchandising. Several very successful range campaigns have been conducted by the company, and it is now preparing for this year's activities. The company's range promotional work is of an educational nature, the electrical dealers making the actual sales. Through the co-operative efforts of the dealers a saturation of one range to every five customers has been reached.

Littleton, Col.—An electric range campaign now being conducted by the Arapahoe Light & Power Company was launched with a lecture, demonstration and free luncheon to which all the housewives of the community were invited. Mrs. Margaret Gaffrey, a factory demonstrator of the Westinghouse Electric & Manufacturing Company, conducted the demonstration. Thomas McGrath is local manager of the company.

We can't make a "clean-up" here

and then move on to another town

We are essentially a part of the industrial and social life of this community.

We are one of your local manufacturers—we sell electricity and electric appliances.

Like your other local merchants, our success depends upon your continued satisfaction. We cannot sweep into town, do business by methods that satisfy temporarily, and then move on.

We shall be here next year and the year after. We shall be serving this same community. Therefore—merely because it's good business policy, if you will—we must serve you well. Whether you buy electric current or electric appliances or both, we aim to give you full, complete, thorough, courteous service.

Tell us how we may improve our service. We'll appreciate your suggestions. You'll be helping us to improve our business—which is to earn and to maintain your satisfaction with our service.

Telephone 99

CONCORD ELECTRIC COMPANY

Your local merchants must serve you faithfully and well

Their continued prosperity depends upon your continued satisfaction

During 1924 you will make many, many purchases. And in each instance you will buy from one of two classes.

You will buy from merchants permanently located in this community or you will buy from firms out of town.

One thing is certain. If you buy from your local merchants, you buy safely and securely.

Errors will happen. Mistakes will occur. Exchanges and adjustments must sometimes be made. In such cases, your local merchant is at hand. But how sure can you be that a man a thousand miles away will give your case the careful attention it deserves?

Your local merchants MUST serve you well. Their business depends upon your satisfaction.

And remember, this company is one of your local merchants. We sell electricity and gas and appliances. And we are as eager to serve you well as any of your other local merchants.

Telephone 1550.

Fitchburg Gas & Electric Light Company

It's an essential part of our duty

To make electric appliances easily available to our customers

Even when your home is wired for electricity, you are not necessarily enjoying the full benefit of our service.

No. You and your family enjoy the full advantages only when your home is equipped with those appliances which enable electricity to give you complete service.

Therefore—as an essential part of our duty to you—we test all electric appliances that are placed on the market. We pick those which give you the most efficient service at least cost of operation.

Then we offer them for sale on terms and prices which make them available to any of our customers.

Haverhill Electric Company

Telephone 123.

THREE GOOD-WILL ADVERTISEMENTS OF TENNEY COMPANIES WHICH FEATURE THE CENTRAL STATION'S PERMANENCE

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
from All Parts of the World

Photostat copies or English translations of complete articles will be furnished at cost upon request

Hydro-Electric Development and Steam Equipment

Piping for High Pressure and Temperature.—Owing to the fact that there is a decided tendency toward the use of higher steam pressure the problem of piping becomes exceedingly complex. To build a valve to withstand a high pressure means merely the addition of properly distributed metal, but when the temperature is increased certain physical characteristics of the metal have changed. Its strength has been reduced and certain metals which could be used for high pressures and low superheats cannot be used for high pressures and high superheat. Besides the general problem, frictional loss in superheated lines, pressure drop in fittings and joints for high-pressure steam lines are considered.—*Power Plant Engineering*, April 15, 1924.

Effect of Excess Air on Flue Temperatures and on Efficiency.—A. K. BAK.—Variation in air quantity has a direct effect upon the mass of flue gas discharged and also gives rise to changes in flue-gas temperature. Air quantity thus has an important bearing on boiler losses and efficiency. The author gives the results obtained at the Connors Creek Station of the Detroit Edison Company to establish the relation between excess air and stack gas temperature for a particular boiler and setting.—*Power*, April 22, 1924.

Hydro-Electric Development at Isle Maligne.—J. P. CHAPLEAU. — A large power development is being undertaken by the Quebec Development Company on the Saguenay River. Twelve turbine units will be installed having a total capacity of 540,000 hp. The turbines will operate under a head of 110 ft., developing a total of 45,000 hp. each under this head. Details of turbine construction are given.—*Canadian Engineer*, May 6, 1924.

Bucket Wear in Modern Steam Turbine Wheels.—R. M. NORSTROM.—Factors in the design and construction of modern steam turbines affecting the wear and efficiency of buckets are discussed. The relative advantages of pressure-stage versus velocity-stage turbines in this particular respect are compared.—*National Engineer*, May, 1924.

Generation, Control, Switching and Protection

Thermo-Regulator and Its Applications.—ARVID WESTERBERG.—A Swedish scientist, Dr. A. Appelberg, found, several years ago, that an electric current could be interrupted by a very minute distance between two Wolfram contacts in vacuum. This principle has been applied successfully to a thermo-regulator. In its simplest form the regulator consists of an evacuated glass tube of the size of the common thermionic valves. The current path in the tube consists of two Wolfram contacts. One of these contacts is attached to a fixed support and the other to a spring actuated by a bimetallic strip. The most important advantage of the new arrangement, as compared with previous types of thermo-regulators, is the exceedingly small mechanical movement necessary to break or close the current path. This results in very sensitive regulation. The author outlines a variety of uses to which the new regulator has been applied. The most important of these are thermostats, current limiters, intermittent lights and switches with time control. The first function has been applied successfully to a number of household appliances such as electric irons, ironing machine, cooking apparatus, electric stoves, etc.—*Teknisk Tidskrift (Swedish), Elektroteknik*, Feb. 2, 1924.

High-Voltage Oil-Circuit-Breaker Tests.—J. B. MACNEILL.—An abstract of this paper may be found in the ELECTRICAL WORLD report of the A. I. E. E. spring convention, April 19, 1924, on page 766. — *Journal of A. I. E. E.*, May, 1924.

Wind Power for Farm Electric Plants.—Many experiments are being conducted to develop a practical and commercial windmill that will supply the average farmer with power to generate the necessary electricity for lighting and pumping and for operating the many appliances that are used on a modern farm. Test data on a 15-ft. wheel that have been collected over a period of one year show some interesting facts. These data are reviewed. Losses due to air drag, best size of wheel for farm electric light plants and a combination plant for generating electric power and pumping are particularly treated.—*Paper presented before the A. S. M. E., Cleveland*, May 27-29, 1924.

Transmission, Substations and Distribution

Modulus of Elasticity for Transmission Lines.—STEN VELANDER.—The author gives the result of a series of tests on transmission lines of copper and steel-aluminum. It is shown that, as a general rule, the wire obtains a permanent elongation the first time the load is applied. After a certain length of time under load the wire becomes perfectly elastic, but the modulus of elasticity is somewhat different from that of the original material.—*Teknisk Tidskrift (Swedish), Elektroteknik*, March 1, 1924.

Dielectric Losses and the Cause of Breakdowns of Solid Dielectrics.—M. Z. DEMEREC.—The author reviews the various theories that have been put forward as explaining the losses and breakdown of dielectrics. After this review of the entire subject the author concludes by stating that at present the tendency seems to be away from the theoretical formulas and toward more practical development. Formerly the study of the dielectric seemed to be chiefly confined to the phenomena occuring in an ideal dielectric, and the phenomena due to imperfections were more or less neglected. Now the general opinion is that the imperfections are often the determining factors in the behavior of the dielectrics.—*Sibley Journal of Engineering*, April, 1924.

Direct-Current Reactor Design. — D. C. PRINCE.—The author discusses the design of direct-current inductances in a comprehensive manner. Such devices, when properly designed and used in a rectifier circuit, reduce the current variations to a large extent.—*General Electric Review*, June, 1924.

Units, Measurements and Instruments

Theoretical Computation of Corona Losses.—RAGNAR HOLM.—This article is a short description of a new method for the computation of the corona losses in high tension transmission lines. The author states that corona losses are due to the exchange of electrical charges in the surrounding air, which require electrical energy in excess of that corresponding to the capacity of the wires. The object of the present investigation is to compute these charges. The results are given in a formula for the corona loss which differs considerably from the empirical formula given by Peek. Comparison with experimental data indicates a better agreement than that obtained by the Peek formula.—*Teknisk Tidskrift (Swedish), Elektroteknik*, Jan. 5, 1924.

Humidity Records.—E. B. WHEELER. —Water vapor and both gaseous and solid impurities in the air hasten oxidation and corrosion of metals and also reduce the value of the insulation afforded by insulating materials. Telephone apparatus and equipment are particularly subjected to the effects of these conditions so that it was felt necessary to make a study of humidity conditions. A recording method has been developed which has proved very satisfactory. Details of this method are given.—*Bell System Technical Journal*, April, 1924.

Alternating-Current Voltmeter.—L. T. WILSON.—A thermo-voltmeter is described which may be used at all frequencies up to and including a million cycles. This meter retains the usual high sensitivity of thermo-voltmeters so that it requires a very small current—2 milliamperes for full-scale deflection. At present it is made in ranges from 1 volt to 20 volts. Higher voltage ranges can be made, but probably at the expense of lowering somewhat the upper limit of frequency at which the instrument is still accurate. —*Journal of A. I. E. E.*, May, 1924.

Thermo-Electric Method of Testing Pure Iron Alloys.—J. F. T. BERLINER. —This paper is an extension of the work of Dr. Burgess and Mr. Scott on the thermo-electric measurement of the critical ranges of pure iron. The apparatus and procedure used in this

case are virtually the same as those used in previous work. The material was a pure series of iron-carbon alloys prepared by the bureau. The method affords a very accurate means of studying the critical ranges of iron and steel.—*Scientific Paper No.* 484, *Bureau of Standards.*

Illumination

Revised Code of Lighting School Buildings.—The committee on Lighting Legislation of the Illuminating Engineering Society has revised the code issued in 1918, following along the general lines laid down in the first edition. The treatment of the text is done under three general headings: (a) rules, (b) why the fulfillment of the rules is important, and (c) how to comply with the rules. As the code is primarily a safety code, a word of caution has been added on the subject of fire hazard. Illumination standards have been raised to conform with modern practice. Specifications and tables of definite requirements under the glare rule have been included, and a limiting ratio of the maximum intensity to minimum intensity in classrooms has been included in the rule relating to distribution of artificial light. Reflection factors have been specified in the rule relating to color and finish of the interior. The exit and emergency lighting rule has been amplified and a rule relating to the illumination of blackboards has been added.—*Transactions of I. E. S.*, May, 1924.

Motors and Control

Modern Motor Controllers. — J. F. LOCHHEAD. — Classified for light, medium and heavy service, corresponding to fifteen, sixty and two hundred hourly operations, the author describes a number of the latest types of motor controllers, suitable without change to direct current or three-phase operation. Among the salient features is the possibility of withdrawing the contact drum vertically from the controller, so that in case of necessary repair work no connections have to be opened. Arcing tips on the drum segments and reversible fingers are further innovations. Combination drives for two controllers are shown, permitting controller-handle operation following the motions of the crane hook. On several wiring diagrams is shown how the same controller may be used for different motor types, such as series and compound direct-current and three-phase motors.—*Brown-Boveri Mitteilungen*, May, 1924.

Development in Electric Drive for Central-Station Auxiliaries. — J. W. DODGE.—The author outlines the advantages of this form of power over steam and devotes most of the article to the description and method of applying various types of motors and control to this service.—*General Electric Review*, June, 1924.

Electrical Equipment at a New Engine Terminal.—The new engine terminal of the Richmond, Fredericksburg & Potomac Railroad at Richmond, Va., has brought much relief from the difficulties formerly encountered in the handling of a large number of locomotives. Electrical energy has been applied to all points in the roundhouse where it was efficient to do so. A general description is given of the power supply, transmission lines, connections, distribution system, welding facilities, electric traveling hoists, etc.—*Railway Electrical Engineer*, May, 1924.

Interdependence of Irrigation and Hydro-Electric Power.—J. D. GALLOWAY.—The author points out the relation between irrigation projects and the use of hydro-electric power, referring particularly to the Pacific Coast region. The principal characteristics of both the power system and the irrigation system, reservoir sites, development of rivers, etc., are among the subjects considered.—*Journal of Electricity*, May 15, 1924.

Electrophysics, Electrochemistry and Batteries

Mechanically Perfect Electrolytic Nickel. — C. P. MADSEN. — Ordinary electrolytic nickel is brittle and often mechanically imperfect. Furthermore, ordinary electrolytic nickel tends to become cold-short. Theoretical discussion is omitted in the paper, and instead statements are limited to empirical results obtained. Hydrogen alone is not the principal cause of electro-nickel trouble. Organic material and iron are far more important, and their effect depends upon their condition. Soluble organic material is the principal cause of lack of ductility. Organic colloids cause failure after heating the metal, and larger organic particles enter into pit formation during cathode deposition. Means are described for producing electro-nickel almost equal to pure gold in ductility. The use of hydrogen peroxide in the bath is claimed to be an absolute cure for pits and exerts other beneficial effects. An anode is described which gives consistently good results in the above bath. —*Paper presented before the American Electrochemical Society, Philadelphia*, April 24-26, 1924.

Traction

Electric Power Signaling.—W. J. THORROWGOOD.—This is the second article by the author describing the all-electric power signaling installation and electric apparatus installed at the Feltham yard of the Southern Railway in England. In this section he treats track circuits, electric point detection, push-button signal frames, electric clocks and telephone communication.—*Railway Engineer*, May, 1924.

Recent Developments in Electric Locomotives.—N. W. STORER.—The author tabulates data of types, dimensions, weight, capacities, etc., for a number of recent designs of locomotives. The reasons for the several types shown are given, and their designs are discussed. The conclusion drawn is that there is a tendency at this time toward the maximum axle loading with gear and side-rod drive for heavy freight service and toward the individual drive with spring-supported motors for high-speed passenger locomotives. For direct-current locomotives with lighter axle loading, the axle-hung, direct-geared motor is being favored by many. — *Paper presented before the A. S. M. E., Cleveland*, May 26-29, 1924.

Heat Applications and Material Handling

Design of Welds—Flexibility Versus Rigidity.—As there is a wide difference of opinion among experts as to whether a weld in a structure should be designed more rigid or flexible than the parts which it joins, the subject was selected as a topic for discussion at the annual meeting of the society. Several recognized experts in each of the welding fields were requested to prepare short papers outlining their reviews and these papers are given. Carbon arc welding, gas welding, metal arc welding, resistance welding and thermit welding are the subjects considered.—*Journal of the American Welding Society*, April, 1924.

Clear Fused Quartz and the Electric Furnace.—E. BERRY.—The method by which this material can now be produced on a commercial scale is described, together with a description of some of its physical properties.—*General Electric Review*, June, 1924.

Telegraphy, Telephony, Radio and Signals

Cross-Talk in Duplex Telephone Lines.—A. ENGELHART.—The author gives a short review of the disturbances which occur in telephone cables with duplex circuits and the most important of the available means for the elimination of these disturbances.—*Teknisk Tidskrift (Swedish), Elektroteknik*, Jan. 5, 1924.

High-Frequency Amplifiers.—H. T. FRIIS and A. G. JENSEN.—A simplified mathematical treatment of the theory of high-frequency amplifiers is presented, and the theory is verified by experiment. This method of mathematical analysis provides a ready means of predicting the performance and action of an amplifier from a knowledge of the fundamental constants of its circuits and places the design of high-frequency amplifiers on a precise and rational basis. There is also included a description of various methods for quantitatively determining the amount of amplification at high frequencies. Among the specific subjects treated are the tuned circuit and choke-coil amplifiers, loosely coupled transformer amplifiers, amplifiers with several stages and amplification measurements at high frequencies.—*Bell System Technical Journal*, April, 1924.

Radio as a Method for Underground Communication in Mines. — J. J. JAKOSKY.—This report is the second of a series dealing with the electrical methods of underground communication and signaling and is a discussion of some of the factors involved in applying radio in mines. A previous report (No. 2,576) described the results obtained by the use of the "T.P.S." or ground-conduction method of signaling and outlined in a general way the requirements for a practical mine communication apparatus. — *Serial No.* 2,599 *of the Bureau of Mines.*

New Books

Reviews of the Latest Contributions to Technical, Industrial and Commercial Literature of Particular Interest to Members of the Electrical Industry

Die Elektrostahlöfen

By E. Fr. Russ. Munich and Berlin: R. Oldenbourg. 471 pages, 439 illustrations.

The author of this book has gone to great pains to give an exhaustive account of all the electric steel furnaces that were ever conceived and tried. The book contains a short account and criticism of the great variety of types. The preface announces that it is expected to satisfy all questions and problems which a practical steel-mill man might want to ask and solve. Being, however, chiefly a historical account of the development of steel furnaces, the maze of material, which contains unavoidably descriptions of a large number of totally antiquated and—at least in American steel practice—obsolete types, is likely to bewilder the practical man who seeks up-to-date information on the subject. As a compilation of data on electric furnaces or as a reference book useful to a patent attorney the volume can hardly be excelled. A. P.

The Electric Motor Truck

By Edward E. La Schum. New York: United Publishers' Corporation Book Company. 307 pages, illustrated. Price, $4.

For the man who uses delivery trucks in his business or who is considering the purchase of new or additional delivery equipment this book will be of material help in selecting the most suitable kind for his purpose as all types of electric trucks are fully described. It will also be of particular value to many owners and operators of battery-driven vehicles, there being several chapters describing the mechanical and electrical construction of these trucks. There has been a serious lack of this kind of information in a form that would be useful to the average truck driver or garage man, who frequently is not an electrical man. This need is admirably met in several well-illustrated chapters on the operation and care of motive, battery and charging equipment.

Central-station men engaged in the sale of electric trucks or who contemplate establishing a department to develop this business will find extremely valuable data in this book. The transportation field with particular reference to the adaptability of electric trucks for certain classes of work is well covered, and a number of tables showing the comparative fuel, garage repair and other costs for horse-drawn, gasoline and electric vehicles are included. The characteristic advantages of the "electric" are set forth, and due consideration is made for the limitations of the fields for its most economical application. A method for analyzing individual transportation problems is described, together with complete instructions for making studies of existing delivery systems to determine the best equipment, all things considered. Finally, and of considerable importance to the electric truck business because it has not been available before, is a system of cost accounting covering all items of cost in connection with the operation of delivery equipment.

Readers of the ELECTRICAL WORLD will be interested in the author's appraisal of the magnitude of the transportation business which should be done by battery trucks. While only 4 per cent of all city trucking is now being done by electric trucks, he estimates that because they are more economical, speedier and better suited for short hauls and frequent stops they should be used in 75 to 80 per cent of all city service. T. P. K.

Car Lighting by Electricity

A Practical Treatise on the Construction, Operation, Inspection and Maintenance of the Car-Lighting Systems in Use on American Railway Cars. By Charles W. T. Stuart, foreman of car lighting, Philadelphia Terminal, Pennsylvania Railroad. New York: Simmons-Boardman Publishing Company.

This book covers very completely the practical features of lighting systems for railway cars. These include the storage-battery system, the various types of head-end turbo-generator systems and the axle-generator systems. The matter included is almost entirely descriptive, the aim being, as stated in the preface, to present car lighting in such a manner that the engineer or the student may find a comprehensive presentation of the phases that have a direct interest for him or that may, in a general way, assist in the betterment of the art of car lighting.

Messgeräte und Schaltungen zum Parallelschalten von Wechselstrom Maschinen

By W. Skirl. Second edition. 140 pages, 30 tables, 30 full-page connection diagrams and 14 illustrations. Berlin: Julius Springer.

As a handbook for the operating engineer or the student this remarkably clearly written and excellently illustrated book should be a welcome aid. Simple and unpretentious in language, the author explains the requirements for parallel operation of alternating-current generators and the indicating and measuring instruments needed. Wherever necessary for perfect understanding vector diagrams are used in addition to the illustrations. A special chapter is devoted to methods for tying different power systems together, a practice which is today of great importance. Automatic parallel connection is explained on the Michalke system of the Siemens concern. The latest practice of synchronizing sections of very high transmission voltage systems by means of current that is derived from specially equipped condenser-type bushings is fully described. A. P.

Das Elektrische Fernsehn und das Telehor

By Dionys von Mihály. 114 pages, 71 illustrations. Berlin: M. Krayn.

The author deals only with actual television, which means the instantaneous transmission of the complete picture and over only two wires, or preferably by radio communication. It is theoretically impossible to transmit a complete picture instantaneously, but the inventor takes advantage of the limitations of the human eye, disintegrates the original at the sending station, sends the impulses through a wire or the ether, and builds the picture up again at the receiving end, all within about one-tenth of a second, or so fast that the eye does not realize that it really watches a building-up process. While there is actually no comparison whatsoever between the two, the televisor acts on the eye like a motion picture, showing only the resulting action without disclosing the many elemental units of which it really consists.

The many scientists who are at present interested in the solution of this fascinating and extremely promising problem of television will find in this book everything pertaining to the subject.

Book Notes

Nitrogen Fixation, Bulletin No. 11. Ottawa, Canada: Nitrogen Fixation Committee of the Canadian Research Council.

A summary of the present status of nitrogen fixation which describes briefly the different processes and their possibilities. The arc process is advocated as offering the most fruitful field of development, and the committee states that Germany is far ahead of any other nation in nitrogen fixation.

E M F Electrical Year Book. Edited by Frank H. Bernhard. Third annual (1924) edition. Chicago: Electrical Trade Publishing Company. 1,552 pages, completely revised and enlarged.

An encyclopedia of current information about each branch of the electrical industry, with a dictionary of electrical terms and a classified directory of electrical and related products and their manufacturers in the United States and Canada.

Books Received

Appareils of Installations Téléphoniques. By E. Raynaud-Bonin. Paris: J. B. Baillière et Fils. 472 pages, illustrated.

Conduit Wiring. By Terrell Croft. New York: McGraw-Hill Book Company. 458 pages, illustrated. $3.

Light and Work. By M. Luckiesh. New York: D. Van Nostrand Company. 296 pages, illustrated. $4.

The Engineering Index—1923. New York: The American Society of Mechanical Engineers. 700 pages.

Elements of Electrical Design. By Alfred Still. New York: McGraw-Hill Book Company. 535 pages, illustrated. $5.

Power Station Efficiency Control. By John Bruce. London: Sir Isaac Pitman & Sons, Ltd. 244 pages, illustrated.

News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rulings and News of Electrical Men

Pays Tax Under Protest

Puget Sound Power & Light Loses Its Suit and Will Now Sue Seattle in Its Turn

HOLDING that the 1919 property tax on Seattle's street-railway system, now city-owned, is due and delinquent, and that the tax-collecting officers of King County are, under the state laws, required to distrain personal property where taxes are not paid, the three United States District Court judges who heard the arguments in the suits of the Puget Sound Power & Light Company and the Old Colony Trust Company against the city of Seattle and King County handed down a decision *en banc* on Thursday, June 5, dismissing the corporations' application for an injunction. The court held that it had no jurisdiction in the case of the Old Colony Trust Company and that in the case of the Puget Sound Power & Light Company the company has an adequate remedy at law. (See ELECTRICAL WORLD, May 31, page 1146, and June 7, page 1199.)

In obedience to this decision the Puget Sound Power & Light Company on June 7 paid King County the delinquent tax on the municipal street-railway property, amounting with interest to $655,296. Payment was made under formal protest. An amended bill of complaint was filed by the company in the United States court stating that the tax had been paid and that action was being taken to collect three-fourths of it from the city under the terms of purchase agreement. The city contested the acceptance of the amended complaint, holding that the case was not one for the federal court, and thereupon specific performance of the contract between the city and the company was sought by the latter in another bill, which asks that the company be allowed to proceed and exercise its right to collect from the city.

Republican Planks on Water Power and Utilities

Following are the planks on government control of industry, on water power and on conservation adopted on Wednesday evening by the Republican National Convention at Cleveland as part of the platform on which its nominees for President and Vice-president will stand:

Government Control.—"The prosperity of the American nation rests on the vigor of private initiative which has bred a spirit of independence and self-reliance. The Republican party stands now as always against all attempts to put the government into business.

"American industry should not be compelled to struggle against government competition. The right of the government to regulate, supervise and control public utilities and public interests we believe should be strengthened, but we are firmly opposed to the nationalization or government ownership of public utilities."

Water Power.—"The federal water-power act establishes a national water-power policy, and the way has thereby been opened for the greatest water-power development in history under conditions which preserve the initiative of our people yet protect the public interests."

Conservation.—"We believe in the development, effective and efficient, whether of oil, timber, coal or water-power resources of this government, only as needed and only after the public need has become a matter of public record, controlled with a scrupulous regard and ever vigilant safeguards against waste, speculation and monopoly. The natural resources of the country belong to all the people and are a part of an estate belonging to generations yet unborn. The government policy should be to safeguard, develop and utilize these possessions."

Bursts of applause from the delegates and from the galleries greeted these planks when they were read by the chairman of the resolutions committee.

La Follette Advocates Public Ownership of Water Power

The platform of the "La Follette progressive Republican delegates," presented to the committee on resolutions of the National Republican Convention at Cleveland this week, read to the convention as a minority report and evidently prepared as a platform on which the Republicans threatening secession from their party can run Robert M. La Follette for President on an independent ticket, is a radical utterance embodying the well-known views of the Wisconsin Senator on railroads, taxation, the federal courts and other political questions.

Of special interest to electric light and power men is the second plank, which calls for the "complete revision of the water-power act, the general leasing act and all other legislation belonging to the public domain" and adds: "We favor public ownership of the nation's water power and the creation and development of a national super-water-power system and strict public control and permanent conservation of all the nation's resources, including coal, iron and other ores, oil and timber lands, in the interest of the people."

Ford's Men Die Hard

Fight Till Congress Adjourns Despite Senate Agreement to Take up Muscle Shoals December 3

DESPITE the unanimous-consent agreement reached in the Senate at the request of Senator Underwood to make Muscle Shoals legislation the unfinished business before the Senate December 3, advocates of the Ford offer kept this subject before Congress almost until the last hour prior to adjournment on June 7. Senator Heflin, one of the supporters of the Ford offer, spoke each day on the subject, charging that the Republicans had failed to give farmers relief they would have had if the Muscle Shoals project had been awarded to Henry Ford. In the House Representative Almon of Alabama, in whose district Muscle Shoals is situated, invited all members to make a trip to the plants during adjournment and get first-hand information.

Under the unanimous-consent agreement in the Senate, Muscle Shoals bills will be taken up as the unfinished business on December 3, which will be the third day of the winter session of Congress, and will remain before that body until disposed of. The procedure under such agreements is that the Senate recess each evening instead of adjourning from day to day, making it possible thereby to renew the same subject promptly upon convening at noon instead of devoting the first two hours of the day to general legislation, which would be the order if an adjournment were taken each evening. When the subject is reached December 3 the bill before the Senate will be the Norris bill as amended and reported by the committee on agriculture and forestry. This, as already explained, provides for a modified form of government control and operation. The strategy of the Ford advocates will take the form of an effort to substitute the McKenzie bill accepting the Ford bid, which was passed by the House, for the Norris bill.

California Oregon Power's New Hydro-Electric Plant

Construction work is now under way on the Copco No. 2 hydro-electric plant of the California Oregon Power Company on the Klamath River in northern California (referred to in the May 17 issue), and it is expected to have the plant completed and in operation by April, 1925.

The plant, as has been previously stated, will be virtually a duplicate of Copco No. 1. It will contain two vertical hydraulic turbines operating under a head of 166 ft., each driving a

15,000-kva. generator—not one 25,000-kw. generator, as originally asserted. The development will consist of a power house, a small concrete diversion dam and combination tunnel and flow line. The diversion dam will be about 1,000 ft. downstream from the present plant, and the new plant in turn about a mile further down the river.

A 110,000-volt transmission line 82 miles in length will be built from the plant to Delta, Cal., where it will connect with a line of the same voltage to be built by the Pacific Gas & Electric Company to carry the power to Cottonwood, a distance of 43 miles more. Wooden-pole structures spaced about 600 ft. apart will be used in the line. It will be a single-circuit transmission line with 250,000-circ.mil conductors having a capacity of 40,000 kw.

The California Railroad Commission has approved a twenty-five-year agreement under which the entire output of the plant will be sold to the Pacific Gas & Electric Company. The contract specifies the delivery of 20,000 kw. with a monthly load factor of 70 per cent.

Canadians Hear of Phenomenal Progress

Ottawa Convention Told that 80 per Cent of Urban Residences in the Dominion Are Electrified—Private and Public Ownership Contrasted

THE Canadian Electrical Association met in convention on Wednesday, Thursday and Friday of this week at Ottawa, Ontario. Being affiliated with the National Electric Light Association, most of the Canadian association's activities paralleled those of the larger body, so that the reports of the numerous standing committees were similar to those presented at Atlantic City last month, though modified to some slight degree to fit Canadian conditions.

In his address on Wednesday morning President P. T. Davies of Montreal showed from Dominion statistics the phenomenal growth of the electric light and power business in Canada. Seven hundred million dollars is now invested in the business, and the number of meters has increased from 44,771 in 1900 to 1,022,525 in 1923, indicating that fully 80 per cent of the homes in urban Canada are supplied with electricity. Last year the per capita consumption of electrical energy was 820 kw.-hr. As in the United States, the cost of electricity to the ultimate consumer has decreased. In Quebec and Ontario, according to statistics gathered by the Dominion Department of Labor, electricity cost only 60 per cent of what it did in 1914. This was due to the smaller capital cost of hydro-electric developments and their greater efficiency.

Contrasting the character of the service rendered by the privately owned utilities of Quebec, Manitoba and British Columbia with that given by the government-owned system in Ontario, Mr. Davies said that in none of the three provinces first mentioned was there any increase in rates for electricity or any shortage of power even during the war, whereas in Ontario not only has there been shortage and curtailment of power from time to time, but also a general increase in rates in 1922, and orders were given to municipalities just recently to increase their rates again. The Ontario government was shown to have invested in the Niagara system a total of $139,000,000, on which the revenue reported was $6,825,553, or 4.9 per cent on the capital, which, Mr. Davies said, is less than the cost of the money and left nothing whatsoever for depreciation, operation and maintenance.

On Wednesday afternoon two illustrated papers were given—one on industrial heating by W. S. Scott of Pittsburgh and the other on new uses of color in merchandising by J. Atwater of New York.

At a luncheon on Thursday the speaker was H. T. Sands, chairman of the Public Relations Section of the N. E. L. A., and on Thursday evening P. B. Zimmerman of Cleveland outlined the Lighting Educational Committee's program. Another speaker on Thursday was S. B. Hood of Minneapolis, who gave an illustrated paper on distribution systems. On Friday George F. Oxley of the headquarters staff told of the advertising and publicity work of the N. E. L. A. Social functions of the convention were shared with the Canadian Electric Railway Association.

At its concluding session on Friday the following officers were elected: President, R. J. Beaumont, Shawinigan Water & Power Company, Montreal; vice-presidents, W. Paxton Little of Niagara Falls, J. B. Woodyatt of Montreal and W. O'Brien of Montreal; treasurer, C. Johnstone of Montreal; secretary, Louis Kon of Montreal.

Philadelphia Electric Company Buys Option on Conowingo

An announcement attributed to Bertron, Griscom & Company, bankers, was published this week to the effect that the Philadelphia Electric Company has acquired an option on the water-power rights on the Susquehanna River at Conowingo, Md., for which a preliminary permit was granted by the Federal Power Commission to the Susquehanna Power Company in July, 1923. At the time the permit was granted the Conowingo project was described as involving the largest single power development on the Atlantic seaboard. An eventual installation of 360,000 hp., or more than the total present development on the American side of Niagara Falls, was said to be contemplated at an ultimate cost of $30,000,000 or more. From such a plant energy could be supplied not only to Philadelphia, 60 miles distant, but also to Wilmington, Baltimore, Washington and even more distant cities. No announcement from the Philadelphia company concerning any immediate plans for hydro-electric development is forthcoming.

North Central Men Gather at Winona, Minn.

Delegates to the number of 175 assembled on Wednesday of this week at Winona, Minn., for the fifth annual meeting of the North Central Geographic Division, N. E. L. A. The first day was spent at an outdoor field meet, when acquaintanceships were renewed and timely electrical topics informally discussed. The Thursday sessions, which were being held as the ELECTRICAL WORLD went to press, were devoted primarily to operating problems. These were discussed at round-table meetings. On Friday the Red Wing experimental rural line was to be discussed by E. A. White, chairman of the Committee on the Relation of Electricity to Agriculture; Prof. E. A. Stewart and C. F. Stewart, and the results attained this spring were to be described. J. E. Davidson, national vice-president N. E. L. A., was to outline the campaign for better home lighting and the conservation of eyesight. A paper on standard meter-service switches by W. L. Wadsworth, Northern States Power Company was also scheduled.

Bill for Reorganization of Executive Departments

The congressional joint committee on reorganization of the executive departments of the federal government, created a few years ago, has submitted its report, and a bill to carry out the committee's plans was introduced before Congress adjourned. Its main provision is one for setting up a government department, whose head shall be a Cabinet member, this department to be called the Department of Education and Relief and to take over the Bureau of Pensions, the Public Health Service and other boards and institutions. The Bureau of Mines and the Patent Office by the terms of the bill would go to the Department of Commerce, and other shifts of function between the departments are made, and a Bureau of Purchase and Supply and an independent Bureau of the Budget established. The sweeping reforms advocated by the engineering bodies of the nation are, except in a greatly diluted form, conspicuous by their absence from the bill.

Women's Public Utility Committee for New York

Sixty-eight women representatives of electric and gas companies of New York State met at the Hotel Astor, New York, on Wednesday, June 11, and organized the Women's Section of the New York State Committee on Public Utility Information. Miss Mary E. Dillon, general manager of the Brooklyn Borough Gas Company, was elected chairman, and Miss Helen Smith, industrial engineer of the Rochester Gas & Electric Corporation, vice-chariman.

Resolutions were adopted providing for the districting of the state and the appointment of a sub-committee for each district. M. S. Sloan, president of the Brooklyn Edison Company and chairman of the committee on Public Utility Information presided.

Institute Plan Succeeds

Regional Meeting of A. I. E. E., Held at Worcester, Brings Out Good Papers and Talk

THE first regional meeting of the American Institute of Electrical Engineers, held at Worcester, Mass., last week and reported in part in last week's issue, was, as there implied, very successful. More than 350 engineers from all parts of the country registered, and the papers were of high caliber and received well-merited discussion.

In the final sessions on Thursday Prof. H. B. Smith presented the notable paper on a new insulator alluded to last week and abstracted in this issue. Another valuable paper was presented by Fred Drake and G. H. Downing on the design of an efficient transformer for radio tuning. The authors gave the design methods and formula for obtaining the desired characteristics and indicated the methods used to handle the inductance and capacity effects encountered.

E. D. Treanor, General Electric Company, Pittsfield, Mass., then presented a paper upon the "thermotel," a device for checking the temperature conditions in distribution transformers. This apparatus is designed to utilize a vapor thermometer (with automatic compensation for changes in ambient temperature) to indicate the heating conditions in distribution transformers by a pointer and scale, with semaphore attachment for field inspection service. In the discussion the point was made that this equipment is not so well adapted to remote indications as to local application. H. M. Hobart called attention to the desirability of limiting the hot-spot maximum temperature to 100 deg. C.

Several hundred small electric generating plants using windmills as prime movers are in successful service in this country, according to a paper on such apparatus presented by F. C. Doughman of the Westinghouse company. A popular size is rated at 1 kw. and, with storage battery and control panel, costs about $800. Recent designs for situations handicapped by protracted calm "spells" include a switch by which the battery can be split in halves and charged at a lower rate when the generator runs at low speed.

TESTS ON LONG COILS

At the final session Thursday evening T. S. Taylor of the Westinghouse company described an interesting series of tests to determine the effects of expansion and contraction upon the insulation of long armature coils. Heat-application cycles corresponding to many years of actual service were accompanied by measurements of mechanical and electrical changes in different types of insulation material, with the result that even where displacements 5 mm. wide occurred no failure of insulation was noted. From the operating viewpoint this negative result is most gratifying.

The closing papers were by C. M. Laffoon of the Westinghouse company on "Short Circuits of Alternating-Current Generators" and by P. L. Alger and A. L. Kimball of the General Electric Company on "Torque Pulsations in Single-Phase Motors." The former outlined a semi-empirical method of computing short-circuit currents, and in the brief discussion following Prof. V. Karapetoff of Cornell University pointed out that differential equations can be used to advantage in short-circuit analyses and demonstrated the line of attack under various assumed conditions. Similar equations were used by Prof. W. V. Lyon of the Massachusetts Institute of Technology in a previous A. I. E. E. contribution. Messrs. Alger and Kimball demonstrated vibration conditions in a single-phase motor and discussed means of eliminating serious pulsations. The redesigning of the motor has been necessary in some cases, and the most effective change was a modification of the number of slots used in the secondary winding.

F. D. Newbury of the Westinghouse company spoke briefly of the value of spring supports in preventing turbine vibrations of excessive magnitude.

Ohio-Pennsylvania Interconnection Furthered

Henry L. Doherty & Company announced this week that a contract of unusual interest to public utility operators has just been closed between the Ohio Public Service Company, a subsidiary of the Cities Service Company; the Cleveland Electric Illuminating Company, the Ohio Power Company and the Pennsylvania-Ohio Power Company by which transmission lines of these companies will be interconnected and power in large amounts will be interchanged.

This arrangement will permit the transfer of 10,000 kw. of electrical energy from the plants of the Cleveland company to the Youngstown district served by the Pennsylvania-Ohio Power Company through the use of the facilities of the four companies involved. It is a progressive step toward a comprehensive system for supplying the power requirements of the great industrial territory in the Middle West, in line with the plans of the companies concerned and others to tie together still more closely the companies serving this region.

Through the arrangement just announced there will be an actual physical interconnection of transmission lines reaching from Toledo and Cleveland in the west to the Ohio River, Pittsburgh and surrounding territory in the east.

Swapping Electrical Energy in Northern Ohio

Announcement is made that the Ohio Public Service Company of Cleveland has purchased 10,000 kw. of power from the Cleveland Electric Illuminating Company for delivery to the Northern Ohio Traction & Light Company at the southern border of Cuyahoga County, this to take the place of energy which the Ohio Public Service Company has transferred from Akron to Niles. The Niles power will be delivered by the Ohio Public Service Company to the Pennsylvania-Ohio Power & Light Company for distribution along the Niles-Youngstown lines. This power will enable the Penn-Ohio Company to supply its demand until the completion of the new Toronto plant on the Ohio.

The details of this complicated interchange of power were announced through T. O. Kennedy, vice-president and general manager of the Ohio Public Service Company at Cleveland.

Middle West Utilities System Now Has 425-Mile Line

A continuous power transmission system under one ownership has been established from St. Paul, Va., to Indianapolis, a distance of approximately 425 miles, by the negotiations just completed by the Middle West Utilities Company for the purchase of the Old Dominion Power Company of Virginia from the John L. Kemmerer interests of New York. This new acquisition is interconnected through the Electric Transmission Company of Virginia with the transmission system of the Kentucky Utilities Company, extending from the state line of Virginia to central Kentucky. There the latter joins the transmission system of the Kentucky Hydro-Electric Company, which connects near Louisville with the transmission system of the Interstate Public Service Company. The Interstate company extends as far north as Indianapolis. All of these systems are controlled and operated by the Middle West Utilities Company. On these systems are four large steam generating stations, and one hydro-electric station is now being constructed on the Dix River.

With the network of lines now stretching north and northwest of Indianapolis into the district which will constitute the southern terminus of the 132,000-volt trunk line being built to tie together other Insull holdings, north, west and south of Chicago, it can be readily seen that a very substantial "superpower" system already exists for serving an extensive industrial territory in the Middle West.

Plates for Hoover's Power Survey Being Made

Seventeen plates which have been prepared by the Federal Power Commission in connection with the superpower negotiations being conducted by Secretary of Commerce Hoover now are in the hands of the lithographers. Copies will not be available for distribution, however, until July 1. The maps and curves will be accompanied by a short text setting forth the findings and conclusions of the engineers who assembled the data. The growth of population and of power consumption in each of the fifteen states covered and for the entire Eastern-Northeastern area will be shown. Generating capacity, power loads, hydro-electric possibilities, transmission lines and coal deposits will also be shown.

The information which will be set forth in these lithographs will be of particular value to every one interested in power since it concentrates in graphic form information from several federal agencies and from the fifteen states included in this survey.

To Protect Jobber's Stock

This, Says A. G. Kimball Before Hot Springs Convention, Is a Manufacturer's Obligation

"ANY manufacturer that sells a special line at a schedule price is under obligation to protect the jobber's stock," declared A. G. Kimball, president Landers, Frary & Clark, on June 5, speaking before the summer convention of the Electrical Supply Jobbers' Association in Hot Springs, Va., of which the opening sessions were reported last week. "This, of course, puts the manufacturer at a disadvantage," continued Mr. Kimball, "but the jobber cannot give service without stock and cannot maintain this stock without protection." There is a natural affinity, therefore, between the well-established manufacturer and the well-established jobber. But if the jobber carries a line, he should, in Mr. Kimball's opinion, "carry the torch for that brand of goods" and sell all the important items in the line. "There is no reason," the speaker said, "why the jobber who can sell his services for 5 per cent cannot hold the business of the central station."

Commenting on the rapid development of distribution through non-electric stores, Mr. Kimball gave it as his opinion that hardware jobbers are making progress because it is their habit to put more of their profits back into their business to develop special lines than is customary with electrical jobbers. It is not logical to try to keep non-electrical dealers out of the field, for there is a place for electrical appliances in those stores that sell to the home. Electrical jobbers should sell to both fields and develop the fittest dealers. The jobber will always have a place in selling shelf goods because he offers the most economical method of intensively working a small territory.

The Lighting Campaign

In the absence of J. E. Davidson, chairman of the Lighting Educational Committee, W. E. Robinson presented the plan of the national essay contest which the committee is organizing and called upon the jobbers to support what he considers an invaluable influence for filling the valley of business with which the industry is now confronted. He was followed by P. B. Zimmerman, vice-chairman of the committee, who described in detail the methods by which the campaign is to be conducted.

A plan for the issuance of certificates of quality by electric leagues to mark wiring installations that are adequate and of high quality was described by W. A. Goodwin, vice-president of the Society for Electrical Development. Under this plan a large sign bearing a red seal will mark houses where wiring is being installed which meets or exceeds the leagues' standard. A permanent emblem will be placed on the meter board and a certificate will be given to the owner.

Laurence W. Davis, general manager of the Association of Electragists International, presented a report on preliminary studies of merchandising policies which has been made by a special committee of the association.

Frank S. Price was elected chairman of the Atlantic Division, with J. L. Owens and Clarence Wheeler succeeding themselves on the executive committee, and Frank H. Stewart was elected for the unexpired term of F. E. Stow. G. E. Cullinan succeeds himself as a representative at large on the executive committee. Walter Bissell was elected chairman of the Central Division, with John Schmidtbauer and L. L. Hirsch on the executive body.

At the conference of the Westinghouse Agent Jobbers' Association, which immediately preceded the Jobbers' Association meetings, F. M. Averill was re-elected as president and J. S. Tritle as vice-president. Samuel A. Chase was made an honorary life member of the executive committee in recognition of his long services to the organization.

A. I. E. E. Prize Goes to Paper by Hayden and Steinmetz

The report of the committee on award of prizes offered by the American Institute of Electrical Engineers for papers written by its members has been approved by the board of directors. The transmission prize went to the paper on "High-Voltage Insulation," by J. L. R. Hayden and the late Charles P. Steinmetz, with honorable mention to Howard S. Phelps and E. Dean Tanger for their paper on "A New Method for Routine Testing of Alternating-Current High-Voltage Paper-Insulated Cable," and also to F. S. Dellenbaugh, Jr., for his paper on "Artificial Transmission Lines with Distributed Constants." No eligible paper was entered in competition for the "first paper" prize.

Field Work Started in the Home-Lighting Contest

Immediately after the Atlantic City N. E. L. A. convention, at which the home-lighting contest arranged by the Lighting Educational Committee of the electrical industry was launched, Kenneth A. McIntyre, a member of the staff of the Society for Electrical Development, started on a tour in the interests of the plan. He has already visited Minneapolis, Chicago, Jackson, Mich., Detroit, Toronto, Rochester, Syracuse, Boston, Cleveland, Grand Rapids, Winona, Minn., and St. Paul.

The first effort is being directed toward organizing the United States and Canada by divisions, with a regional director in each and with a man in every locality or in each company to organize the local phase of the contest. After the divisional and local organization movement gets under way a series of regional meetings will be held in accessible centers. In these meetings a half-day session, or longer, will be devoted to conference on the successful operation of the local contest. Radio talks, illustrated lectures and other publicity material are being prepared by the society, and the co-operation of the daily newspapers is being sought. The society will take care of the distribution of all material to be used in connection with the actual home-lighting contest, which will be furnished at cost to the local committees.

Drought Still Felt

Shortage of Power in California Will, However, Be Met—Emergency Rates Asked

A HEARING was ordered this week by the California Railroad Commission to be held in Los Angeles on Friday, June 13, to consider the question of operation of electric utilities during the emergency which still persists because of the prolonged drought. All power companies in southern California have been asked to send representatives. The question whether there will be an actual shortage of power is still somewhat doubtful, although present indications are that some shortage can hardly be avoided. Unless fall rains are later and lighter than usual, the amount of this shortage will not, however, exceed a few per cent for the remainder of the year. The purpose of the commission's investigation was to enable it to require the most efficient distribution of the power available and to insure that any curtailment that may be necessary shall be spread as equitably as possible.

Southern California Edison Rates

Increased steam generation with consequent higher power production costs, brought about by the drought in California, has caused the Southern California Edison Company to apply to the commission for authority to file and make effective from July 1, 1924, to March 31, 1925, new rate schedules providing emergency increases over present rates to produce approximately $3,000,000 more revenue. The deficiency in the water supply at present available to the company's hydro-electric plants is the greatest of which any accurate record exists, and the company estimates that its production expenses will be approximately $5,568,000 greater than for an average year. A 20,000-kw. steam plant is being rushed to completion, and this, together with all existing steam capacity and purchased power from other utilities and private industrial plants, will be utilized to avert shortage.

The company sets forth also that the deficiency in the contingency reserve at the end of the year 1924 will be approximately $4,045,000, which deficiency will leave applicant far short of a fair return for the year 1924 and is too great, it is alleged, to be overcome by possible credits to contingency reserve in the years immediately following.

Tenney Will Manage Orange County (N. Y.) Company

Interests identified with the Rockland Light & Power Company, Nyack, N. Y., have acquired the Orange County Public Service Corporation of Middletown and Port Jervis, N. Y., and placed this utility under the management of Charles H. Tenney & Company, Boston, who also operate the Rockland company. The two companies serve about 570 square miles of territory, and the Orange County company's assets are about $5,000,000. The territories are contiguous, and the Orange company operates two small steam and two small hydro-electric plants serving about 6,500 customers.

Hylan on "Power Trust"

New York Mayor Attacks the Private Ownership and Operation of State's Hydro Plants

JOHN F. HYLAN, Mayor of New York City, who is often accused of serving as a mouthpiece for the public views of William R. Hearst, spoke at a Conference of Mayors at Rochester, N. Y., last week, when he made an attack on public utility companies, including an onslaught on what he termed the "water-power trust." On this last topic he said in part:

"An official of the National Electric Light Association was credited with a statement recently to the effect that the public should be neither disappointed nor surprised if the rates for electric service were not appreciably reduced by the intensive development of water power for electric generation. Inasmuch as all the people of this state are at last mobilizing with the object of forcing the Legislature at Albany to take definite steps to bring about state development and distribution of hydro-electric power at cost to the cities, this statement is of more than passing interest.

"There will be no appreciable reduction in electric rates if private corporations are to be permitted to create a superpower system of the state's undeveloped water-power resources and distribute electricity for private profit to communities and to the people. If the turning over of our undeveloped water-power resources to private interests for exploitation, as was planned under the Miller régime, becomes an actuality, there will assuredly be no reduction in electric rates. Private profits, not public service, is the method of operation of every public utility under private direction.

"Why should we not have a hydro-electric commission financed by the state and operating along the lines of the Hydro-Electric Commission in Canada? Why should not the more than 3,000,000 hp. which we possess in the state and along our northern border be made the subject of state development and distribution of electric power at cost to the people of the state?"

All Interests Co-operate in Salem Electrical Home

The "home electric" fostered by local electrical leagues has become almost a commonplace in the industry, but an unusual feature of one recently opened at Salem, Mass., under the auspices of the Essex County Electrical Club, was the participation of three municipal electric lighting departments, belonging respectively to the nearby city of Peabody and the towns of Danvers and Marblehead, in the financing of the enterprise. Central-station companies, contractor-dealers, electrical manufacturers, a labor union and jobbers all co-operated in the affair. On the opening evening a dinner attended by about 250 electrical men, women guests, county, municipal and state officials and press representatives was held by the club at the Deer Cove Inn, Swampscott, and the proceedings were broadcasted from a portable radio station installed in the dining room. Chairman H. C. Attwill of the Massachusetts Department of Public Utilities spoke happily upon the congeniality of the atmosphere of the electrical industry. S. Fred Smith, manager of the Salem Electric Lighting Company, is president of the club.

Plans for Coronado Convention Announced

The tentative program for the eighth annual convention of the Pacific Coast Electrical Association (geographic division N. E. L. A.), to be held at Coronado, Cal., June 16-20, have been announced. One of the features of the convention will be the public service conference to be held on the afternoon of June 20. R. H. Ballard, vice-president and general manager of the Southern California Edison Company, will preside at this conference. The program will include addresses by representative utility men of California which will show the public and those in the electrical industry what private utilities are doing today to render service.

General business meetings, committee reports and the election of officers will take up the morning of Tuesday, June 17. In the afternoon there will be sessions of the commercial, technical and stores sections. All day Wednesday and Thursday morning will be given over to business sessions of the various sections. General business sessions and a conference addressed by national representatives are scheduled for Friday morning. A registration of from four to five hundred is expected.

Citizens' Advisory Committee to Aid Giant Power Board

An advisory committee of nineteen persons prominent in various lines of industry and economics, from all parts of the country, with Major General Crozier, former chief of the army ordnance department, as chairman, has been appointed by the Pennsylvania Giant Power Survey Board, of which Morris L. Cooke is director. This committee will receive the report of the Giant Power Survey, now under way, when it is completed, and will be asked to consider the Pennsylvania plan in its relation to national plans and to bring the project before the country generally. Besides Major General Crozier the committee comprises George Foster Peabody, New York; Samuel Gompers, president of the American Federation of Labor; Professor Irving Fisher of Yale; Arthur E. Morgan, Dayton, Ohio; Francis Lee Stuart, Essex Falls, N. J.; William S. Twining, former Transit Director, Philadelphia; Fred T. Gabay, Toronto, Ont.; Fred R. Low, New York City; Arthur P. Davis, San Jose, Cal.; Charles E. Merriam, Chicago; Henry S. Graves, New Haven, Conn.; Martha Brinsley Bruere, New York City; George W. Norris, Philadelphia; Herbert Quick, Berkeley Springs, W. Va.; Leo S. Rowe, Washington, D. C.; Caspar F. Goodrich, Princeton, N. J.; Herbert Knox Smith, Hartford, Conn., and Joseph Hyde Pratt, Chapel Hill, N. C.

Training Course in Lighting

Outline of Plans Made Jointly by the Illuminating Engineering Society and N. E. L. A.

A SKETCH of the plans for a training course in lighting to be given under the joint auspices of the Illuminating Engineering Society and the Lighting Bureau of the National Electric Light Association has just been issued. This course provides for home study in July, August and September, with an instruction and inspection tour from October 6 to October 26, and leads up to the convention of the Illuminating Engineering Society, to be held at Briarcliff Lodge, N. Y., on October 27-31.

Recognition on the part of many central-station companies of the need for a larger number of competent, experienced illuminating engineers in the lighting field led the N. E. L. A. Lighting Bureau in 1923 to arrange for a course of training which would supply an essential groundwork in lighting to men about to take up such work for central stations. A committee on promotion of central-station illuminating engineering was organized with Preston S. Millar of New York as chairman, the other members being E. W. Lloyd of Chicago, A. C. McMicken of Portland, Ore., G. E. Miller of Cleveland, C. J. Russell of Philadelphia, Sarah M. Sheridan of Detroit, L. R. Wallis of Boston, Arthur Williams of New York and R. R. Young of Newark, N. J. This committee enlisted the assistance of the Illuminating Engineering Society, and the projected training course resulted. As a part of it men who are among the best qualified in the country will devote their time and energies, without cost, to the instruction of students in the science and art of illumination.

DETAILS OF PLAN

This opportunity is intended primarily for central-station companies which do not now employ illuminating engineers or lighting specialists, but so far as practicable students will be accepted also from companies which are so equipped. It is suggested that every company taking part select a man who is preferably an engineering graduate with at least two or three years of central-station experience. The company should free him from part of his duties to permit him to take the three months' home course, which involves periodical written examinations, leading up to a final one early in October in Chicago, where the students will be assembled. Those who prove qualified will then take the training tour, which will include inspection trips in Chicago, South Bend, Detroit, Cleveland, Washington, New York and Boston and will conclude with attendance at the I. E. S. convention. Expenses for each man taking the course, except those from a great distance, are put at $1,000. Ward Harrison, National Lamp Works, Nela Park, Cleveland, is chairman of the I. E. S. training course, and further details will be furnished by him or by Preston S. Millar, whose address is Electrical Testing Laboratories, Eightieth Street and East End Avenue, New York.

Briefer News

Power Club's Next Meeting. — The next meeting of the Electric Power Club will probably be held at the Westchester Biltmore Club, Rye, N. Y., some time in October, 1924.

New York Electrical Society Elects New Officers.—At the annual meeting of this society held on June 5 the following officers were elected for the ensuing year: President, Dr. Erich Hausmann; vice-presidents, S. G. Rhodes, W. S. Murray, and A. E. Allen; secretary, H. E. Farrer; treasurer, David Darlington.

Spokane Section, A. I. E. E., Elects Officers.—James S. McNair of the Washington Water Power Company was elected chairman, G. S. Covey vice-chairman and Joseph Wimmer secretary of the Spokane Section, A. I. E. E., at a recent meeting. H. S. Melvin, D. H. Henderson and J. B. Fisken will compose the executive committee.

Associated Manufacturers of Electrical Supplies Meet Next Week.—The annual meeting of the Associated Manufacturers of Electrical Supplies will be held from June 16 to June 20 at the Hotel Ambassador, Atlantic City., N. J. The general sessions will take place at 8 p.m. Wednesday and 2 p.m. Thursday, and the dinner-dance at 7 p.m. Thursday. The board of governors will meet at 10 a.m. on Thursday. Section meetings will be held throughout the five days.

Merger in North Missouri.—The Missouri Power & Light Company, with headquarters at Mexico, Mo., has acquired the properties of the North Missouri Power Company of Excelsior Springs. These properties serve fifty cities and towns in the northern half of Missouri with electric light and power and were built and developed by Major W. A. J. Bell and S. W. Henderson of Excelsior Springs, through whom the merger is being effected.

Citizens of Utah Town Vote to Sell Municipal Plant.—At a recent special election the citizens of Helper, Utah, voted to sell the city's municipal electric plant. Operation of this plant was discontinued in September, 1917, since which time the municipality has been purchasing energy from the Utah Power & Light Company and distributing it to approximately 400 customers. The experiment has clearly demonstrated the greater economy and reliability of central-station service.

Convention of Iowa Section, N. E. L. A.—Plans for the convention of the Iowa Section, N. E. L. A., which in conjunction with the Iowa Electric Railway Association's convention will be held on June 24, 25 and 26 at the Wahkonsa Hotel, Fort Dodge, Iowa, are being completed. The N. E. L. A. Section will hold sessions on Tuesday and Wednesday mornings and a joint session with the railway association on Thursday morning. The afternoons are to be left free for entertainment. Carrier current, load building and household refrigeration are among the subjects to be discussed.

Dirigible Airship Broadcasts Message from President. — A message from President Coolidge transmitted by wireless from Washington was broadcasted by radio by Commander Zachary Lansdowne of the dirigible *Shenandoah* to the people of Albany, N. Y., on the occasion of the tercentenary celebration of the settlement of that city last week. This is believed to be the first speech which has ever been broadcasted from an airship.

Poughkeepsie (N. Y.) Central Station to Purchase Honk Falls Plant.—The Central Hudson Gas & Electric Company, Poughkeepsie, N. Y., expects to purchase the Honk Falls Power Company, Ellenville, N. Y., with its hydro-electric plant and transmission system. The Central Hudson company has sold $2,000,000 in bonds with this and other extensions in view.

Texas Power & Light Company Expands.—The local companies at Lufkin and Crockett, Tex., have been merged with the Texas Power & Light Company of Dallas, which is negotiating for other plants in east Texas as well as considering the extension of its system to south Texas. The company now serves 120 cities and towns in that state and has finished extending its high-tension lines from Hillsboro to Tyler and Palestine.

Canadian Utilities to Merge. — The Western Quebec Power Company and the Hawkesbury (Ont.) Electric Light & Power Company, both operating on the Ottawa River, are to be amalgamated. The Western Quebec company has a hydro-electric station at Isle aux Chats and also purchases energy from the Montreal Light, Heat & Power Consolidated. The Hawkesbury company, with two hydro-electric stations, serves places in both Ontario and Quebec.

Siam Adopts Metric System. — A weights and measures act recently approved by the Siamese government adopts the metric system as the standard for the country but permits the use of other weights and measures for a period of five years after the law takes effect. After that time the metric system shall be compulsory in such parts of the country as may be designated by royal decree, and penalties are provided for non-compliance.

Industrial Heating Students Win Prizes for Best Notes of N. E. L. A. Course.—V. M. T. Tallman, chairman of the Power Bureau, Commercial National Section, N. E. L. A., has written letters of congratulation to N. L. Roberts, Ohio Public Service Company, Warren, Ohio, and F. I. Woltz, Central Hudson Gas & Electric Company, Poughkeepsie, N. Y., each of whom has won a prize of $25 from the N. E. L. A. in the recently completed courses in industrial electric heating. The two winners each made the best set of notes, Mr. Roberts in the Westinghouse and Mr. Woltz in the General Electric course. The suggestions of the winners are sought in regard to the future work of the industrial heating committee of the Power Bureau, and the publication of their notes is under consideration by the committee.

Utah Section, A. I. E. E., Elects Officers.—At the annual meeting of the Utah Section of the American Institute of Electrical Engineers, held jointly with the Utah Society of Engineers at Saltair, near Salt Lake City, on May 31, new officers for the section were elected as follows: Chairman, H. W. Clark; secretary and treasurer, John Salberg. The executive committee will be C. R. Higson, Lester B. Johnson, W. M. Scott, Leo Brandenburger and Paul P. Ashworth. R. A. Hart was elected president of the Utah Society of Engineers.

Assembled Audience of 40,000 Hears Speech from Executive. — More than forty thousand men and women makers of telephones heard the words of President Charles G. Du Bois of the Western Electric Company in Chicago on June 4, when the employees of the Hawthorne works of that company gathered at the dedication of a newly installed public address system. The system, which enables all the Hawthorne workers to hear one speaker at the same time, is the first permanent installation of this sort to be made in an industrial plant.

Pulpwood and Power in Canada.—The close relation between the manufacture of pulpwood and the output of hydro-electric energy in Canada is dwelt upon by a Montreal statistician, who supports his argument on the way the two industries are growing together by these figures envisaging future possibilities:

Province	Estimated Pulpwood Reserve, Cords	Available Water Horsepower Minimum Flow
British Columbia	285,000,000	1,931,142
Prairie Provinces	185,000,000	4,259,253
Ontario	200,000,000	4,950,300
Quebec	300,000,000	6,915,244
New Brunswick	33,000,000	50,406
Nova Scotia	30,000,000	20,751

International Paper Company Will Not Separate Its Hydro-Electric and Manufacturing Activities. — The International Paper Company asserts that the recent sale by it of a small water-power site not fully developed is not indicative of any policy on the part of the company to dispose of the valuable water power owned in New York and New England States and that it will continue to operate its large Sherman Island plant. The company is not contemplating segregation of its production of hydro-electric activities from manufacture of paper. The trend in the future will be to develop more fully the power sites so that production of electricity can be attained on a scale more commensurate with amount of power available. A new 9,000-hp.

feeder project on the Saranac River in which the International has a one-third interest is about completed and will go into operation shortly.

Paris Company Adding 105,000 Kw., with as Much More to Come.—With the ultimate addition of six units of 35,000 kw. each, three of which are under erection, the capacity of the St. Ouen plant of the Compagnie Parisienne de Distribution d'Électricité will reach the 400,000-kw. mark. This company, which maintains south of Paris another plant of 130,000 kw. ultimate rating, supplies electricity for lighting and power to the whole of the Paris area, other plants supplying the energy to the street cars and subway substations. Current is generated at 12,500 volts, four-phase, and is transformed to single-phase for the left bank of the Seine and the Champs Elysées district of the city, while the rest of Paris is supplied with direct current.

One-Man Electric Automobile.—Probably the smallest electrically propelled automobile ever built in large quantities is a car made in Germany and seating comfortably one person. The weight of the car, according to the *Elektrotechnische Zeitschrift* is only 360 lb., of which the twelve-cell battery weighs 160 lb. and the motor 40 lb. The car has no chassis, the body being built solidly enough to support front and rear axle. The 4,000-r.p.m. motor drives the right rear wheel with a chain. The 24-volt battery is rated at 80 amp.-hr. and is sufficient for an operating radius of 36 to 42 miles at an average speed of 14 miles per hour. Shunting the field winding on the motor gives the highest speed, 20 miles an hour. To charge the battery requires only 3 kw.-hr., so that the operating cost of the car per mile is lower than the average trolley fare.

Illinois Northern Utilities to Build Hydro-Electric Plant at Dixon, Ill.—Work will start at once, the Illinois Northern Utilities Company announces, on a hydro-electric plant on Rock River at Dixon, Ill., to replace the one now in existence. The new plant, which will be the largest water-power development in that part of the state, will have a rating of 10,000,000 kw.-hr. a year. When it is completed it will, it is said, in conjunction with the company's steam plant at Dixon, permit the handling in an emergency of the entire system from that point.

Society for Testing Materials to Convene at Atlantic City.—The twenty-seventh annual meeting of the American Society for Testing Materials will be held at Atlantic City, N. J., in the week beginning June 23. Parallel sessions will be held on four days and a great number of papers presented. Among proceedings of special interest to electrical men are the report on electrical insulating materials by F. M. Farmer, papers on "Some Electrical Properties of High-Resistance Alloys" by M. A. Hunter and A. Jones, "Sludging Tests for Transformer Oils" by E. A. Snyder, "An Accelerated Electrolytic Corrosion Test" by R. J. Anderson and G. M. Enos, and "Magnetic Tests of A. S. T. M. Drills" by W. B. Kouwenhoven. C. W. Burrows will report for the committee on magnetic properties and F. P. Fahy for the committee on magnetic analysis.

Manufacturers Back Pan-American Conference to Be Held at Lima, Peru.—A conference of representatives of the leading manufacturers of the United States interested in Latin-American trade was held in Boston last week under the auspices of the American Engineering Standards Committee. Resolutions drawn up by a committee headed by Charles E. Skinner of the Westinghouse Electric & Manufacturing Company were passed indorsing the action of the Pan-American Union in calling a conference on Pan-American standardization at Lima, Peru, next November as affording an opportunity to take initial steps of far-reaching importance in the establishment of a sound basis for better and more intelligent Pan-American trade. Standardization, not through legislation or government pressure, but upon a basis of merit and voluntary co-operation, was favored. A committee of five is to aid in making the Lima conference successful.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations is published in the first issue of each volume. See January 5 issue, page 72, for latest list.]

Associated Manufacturers of Electrical Supplies—Hotel Ambassador, Atlantic City, N. J., June 16-20. Frederic Nicholas, 30 East 42d St.

American Society of Civil Engineers—Pasadena, Cal., June 16-20.

Pacific Coast Electrical Association—Hotel Coronado, Coronado, Cal., June 17-20. S. H. Taylor, 527 Rialto Bldg., San Francisco.

Georgia Electrical Association—East Lake Country Club, Atlanta, June 18-19. W. C. Drake, 75 Marietta St., Atlanta.

American Society of Agricultural Engineers—Lincoln, Neb., June 18-20.

Empire State Gas and Electric Association—Commercial Section, Buffalo and Niagara Falls, June 19-20. C. H. B. Chapin, Grand Central Terminal, New York.

Wyoming Utilities Association—Casper, Wyo., June 23-24. H. C. Chappell, Natrona Power Company, Casper.

American Institute of Electrical Engineers — Annual convention, Edgewater Beach (Chicago), June 23-27. F. L. Hutchinson, 33 West 39th St., New York.

American Society for Testing Materials—Chalfonte-Haddon Hall Hotel, Atlantic City, N. J., June 23-27.

Iowa Section, N. E. L. A.—Wahkonsa Hotel, Fort Dodge, June 24-26. M. G. Linn, Des Moines Electric Co., Des Moines.

National Council Lighting Fixture Manufacturers—Atlantic City, N. J., June 25-27.

Society for the Promotion of Engineering Education—University of Colorado, Boulder, Col., June 25-26. F. L. Bishop, University of Pittsburgh, Pittsburgh.

Northwest Electric Light and Power Association—Gearhart Hotel, Gearhart, Ore., June 25-27. G. H. Gueffroy, Pacific Power & Light Company, Portland.

American Physical Society—Stanford University, Cal., June 26.

Association of Municipal Electrical Utilities of Ontario—Niagara Falls, Ont., June 26-28.

Ohio Electric Light Association—Hotel Breakers, Cedar Point, Ohio, July 8-11. D. L. Gaskill, Greenville, Ohio.

East Central Division, N. E. L. A.—Cedar Point, Ohio, July 9. L. B. Herrington, Kentucky Utilities Co., Louisville.

Pacific Coast Electrical Supply Jobbers' Association—Del Monte, Cal., July 24-26.

Law Students to Study Public Utilities.—Public utility discussions calculated to interest city and county officials, officers of public utility companies and others will make up the annual public utilities conference at the University of Iowa on July 2 and 3. The conference will be a part of the university summer law school for practicing attorneys and law students. Among the topics announced are "Recent Developments in Public Utilities Law" and "Does Iowa Need a Public Utilities Committee with Regulatory Powers Over Public Utilities Generally?"

British Columbia Mining Interests Demand More Water Power.—The West Kootenay Light & Power Company, Nelson, B. C., has applied to the provincial Water Rights Department for a permit to store 678,500 acre-feet of water in Kootenay Lake. If a permit is granted, the company plans to dam the Kootenay River at Granite, submerging the Grohman Rapids and raising the lake low level at Nelson 6 ft. The company's No. 2 plant at Upper Bonnington develops 30,000 hp., and plant No. 1 at Lower Bonnington, now under construction, will develop an equal amount. With the 6-ft. lake storage proposed, each plant will have a capacity of 50,000 hp. to 60,000 hp., giving a combined capacity for the two plants of 110,000 hp. The constantly increasing requirements of the Consolidated Mining & Smelting Company of Canada for its Trail plants are the motive for the proposed further power development of the West Kootenay company, which is a subsidiary of the Consolidated.

Carrying Electricity to the Catskills.—The absorption by the New York State Gas & Electric Company of Ithaca of several smaller companies, already recorded in these columns, will bring with it the extension of modern electric service to the entire district between the Catskill Mountains and the headwaters of the Delaware. The western slopes of the mountains will be traversed by a long loop of 110,000-volt transmission lines connected with the trunk lines near Little Falls at one end and at Kingston and Liberty at the other. From this loop there will be six branches radiating to the more important communities in Delaware and Sullivan Counties and connecting them one with another. The total cost of these extensions is put at more than a million dollars. A similar development is taking place in the western and southwestern sections of the State, where the New York Central Electric Corporation, a consolidation of several small companies, is building connecting links to the trunk lines carrying Niagara power, assuring many communities in Wyoming, Steuben and Allegany Counties a greater and more certain supply of electrical energy. Altogether, including other important extensions already noted, nearly 400 miles of high-voltage lines are being added this year to the 12,000 miles of transmission systems in New York State.

Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men Engaged in all Branches of the Electrical Industry

Judge Debevoise Leaves Industry to Join Rockefellers

Thomas M. Debevoise, for many years legal counsel for the principal national associations of the manufacturing and jobbing branches of the electrical industry, has announced his resignation from association work and his complete withdrawal from the electrical industry. He will succeed the late Starr J. Murphy as personal counsel to John D. Rockefeller and John D. Rockefeller, Jr. Mr. Debevoise has been counsel for the Electrical Supply Jobbers' Association for twenty years, and in addition has successively become counsel for the Associated Manufacturers of Electrical Supplies, the Electrical Manufacturers' Council, the Electrical Hoist Manufacturers' Association and the Society for Electrical Development. These contacts have naturally brought with them a very close association with the Electric Power Club and the Electrical Manufacturers' Club and have placed him in a unique position as official legal adviser to the associated industry. His resignation will take effect July 1.

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The Electrical Manufacturers' Council has announced the appointment of Francis E. Neagle to succeed Judge Debevoise, and a committee was appointed by the jobbers' association at its convention last week in Hot Springs, Va., to take action on the selection of new counsel, but has not yet reported. Mr. Neagle is a partner of Judge Debevoise.

R. P. McClellan has been made manager of the Brooke division of the West Penn Company, with headquarters at Wellsburg, W. Va.

H. I. Babbitt, formerly district manager of the West Virginia & Maryland Power Company at Terra Alta, W. Va., has been transferred to Washington, Pa., as division manager of the West Penn Power Company.

Hugh Gordon, who has been attorney for the California Railroad Commission for the past four and a half years, has tendered his resignation, effective July 1, to return to Los Angeles, where he will resume the private practice of law.

Frederick Krug of the Porto Rico Railway, Light & Power Company, San Juan, has been advanced to the position of superintendent of power production under the recent reorganization of the company's light and power division. In his new position Mr. Krug has charge of all power production, transmission and main substations. Mr. Krug went to Porto Rico two years ago as superintendent of the La Plaza hydro-electric plant of the Porto Rico Railway, Light & Power Company, having resigned as assistant superintendent of the electrical department of the New York & Honduras Rosario Mining Company.

Carl I. Wheat, assistant attorney for the past two years on the California Railroad Commission, will succeed Hugh Gordon as attorney for that commission on July 1.

Owen D. Young, chairman of the board of directors of the General Electric Company, was elected president of the board of trustees of St. Lawrence University, Canton, N. Y., on Monday, June 9, at its annual meeting. He is succeeding Judge Ledyard P. Hale, resigned. Mr. Young, who is an alumnus of the university, class of 1894, has long been active on the board of trustees.

Mortimer E. Cooley, dean of the engineering schools of the University of Michigan and past-president of the Federated American Engineering Societies, was chosen by Michigan Democrats at their pre-primary conference held recently in Flint as their candidate for the long and short terms as United States Senator.

Herbert B. Dwight, designing engineer for the Canadian Westinghouse Company, Hamilton, Ontario, and author of a large number of articles and books, principally upon transmission-line subjects, has been awarded the degree of doctor of science by McGill University, Montreal, from which he was graduated in 1909 in electrical engineering.

Edward J. Doyle, until recently secretary and treasurer of the Commonwealth Edison Company, has been elected vice-president in charge of finances. Mr. Doyle succeeds William A. Fox, who will hereafter devote his time to the interests of several other companies under the management of Samuel Insull and associates. Mr. Doyle has served twenty-eight years with the Commonwealth Edison Company and its predecessor, the Chicago Edison Company, beginning as an office boy in the office of Samuel Insull on March 1, 1896. Later he became Mr. Insull's private secretary. In 1913 he was promoted to assistant secretary and assistant treasurer of the company, and a few months later, in 1914, he was made secretary and treasurer. John W. Evers, Jr., has been elected secretary and assistant treasurer and George W. Williamson treasurer and assistant secretary.

J. M. Curtin Vice-President of Power Club

J. M. Curtin, who was elected a vice-president of the Electric Power Club at the meeting in Absecon, N. J., has been manager of the industrial sales department of the Westinghouse Electric & Manufacturing Company since 1913. Mr. Curtin entered the employ of the Westinghouse company in the fall of 1898, following his graduation from Pennsylvania State College. After spending three years in the apprenticeship course and in getting practical experience, he joined the old alternating-current department as a correspondent, remaining there until 1903, when he became connected with the office of F. H. Taylor, then second vice-president of the Westinghouse Electric & Manufacturing Company. In 1905 Mr. Curtin was transferred back to East Pittsburgh, entering the industrial sales department and engaging in sales negotiation work. In 1909 he was promoted to the position of assistant to the manager of that department, and four years later his ability was further recognized when he was elevated to the position he is holding at the present time. In addition to being active in the Power Club Mr. Curtin is a member of the National Electric Light Association and of the executive committee of the Westinghouse Agent Jobbers' Association.

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Charles A. Williams, formerly with the transmission and distribution department of the Philadelphia Electric Company, is now assisting Prof. T. H. Dillon at Harvard University in initiating a course in public utility management in the Graduate School of Busi-

ness Administration. Mr. Williams was chiefly concerned with economic analysis of distribution methods with the Philadelphia Electric Company and will be engaged in gathering teaching material for the course, which will start at the Harvard Business School early in 1925.

Henry A. Lardner, a vice-president of the J. G. White Engineering Corporation, was recently elected Mayor of Montclair, N. J.

Justin L. Fearing, formerly a member of the examining staff of the United States Patent Office and more recently associated with the patent department of the Western Electric Company, Inc., has opened offices in Boston, specializing in soliciting patents.

V. E. Rockefeller, formerly superintendent of the Washington (Pa.) district of the West Penn Power Company, has been appointed district superintendent of the Allegheny Valley Light Company at New Kensington, Pa.

Elmer E. Barnard, engineer of way and structures of the Lynchburg (Va.) Traction & Light Company and the Roanoke (Va.) Railway & Electric Company, has been appointed to the State Board for the Examination and Certification of Professional Engineers, Architects and Land Surveyors by Governor Trinkle. Mr. Barnard will fill the vacancy on the board caused by the recent death of Major Peyton B. Winfree.

M. D. Church, for the past nine years chief engineer of the Terry Steam Turbine Company, has been appointed general manager of the Moore Steam Turbine Corporation, Wellsville, N. Y. Since graduation from Syracuse University in 1906 Mr. Church has given his attention almost exclusively to steam-turbine work. He is a member of the American Society of Mechanical Engineers, serving on the power test code committee of the steam-turbine division.

Herman Lemp, engineer in charge of the internal-combustion-engine department of the General Electric Company at Erie, has resigned to join the Erie Steam Shovel Company. Mr. Lemp's resignation marks the severing of an association with the General Electric Company which has extended over a period of forty-two years. He joined the staff of Thomas A. Edison early in 1882, five years later identifying himself with the Thomson-Houston Electric Company in West Lynn, Mass. Subsequently he held the position of chief engineer of the Thomson Electric Welding Company, and in 1895 he became associated with Professor Thomson in research work. Later he was transferred to the Erie plant of the General Electric Company. Mr. Lemp has been active in the design of electric welding apparatus, self-exciting compound alternating dynamos and regulating devices in use today and has to his credit more than two hundred patents, covering inventions in these fields. In his new connection with the Erie Steam Shovel Company he will assist in the design of new types of shovels, some of them using the internal-combustion engine as a prime mover.

E. O. Brown New Manager at Bloomington

Edwin O. Brown, manager of the Illinois Power & Light Corporation's property at Galva, Ill., has been appointed manager of the company's system at Bloomington, Ill., succeeding D. W. Snyder, Jr., recently made vice-president and a director of the Illinois Traction, Inc. Mr. Brown entered the electric lighting business in 1902. In 1913 he and his associates sold out their transmission-line interests to the Hodenpyl, Hardy Company and went to Galva, where they built a plant and took over the electrical properties at

E. O. BROWN

Cambridge, Altoona, Oneida, Victoria and Lafayette. These properties were operated by them until 1917, when they were taken over by the McKinley interests and Edwin O. Brown was made manager of them. In 1923, when the Illinois Power & Light Corporation assumed control of the properties, Mr. Brown was retained as manager. Mr. Brown is a charter member of the Galva Rotary Club and served as president of the Galva Chamber of Commerce from 1921 to 1923.

G. C. Estill, formerly superintendent of way and structures of the New Orleans Public Service, Inc., has been appointed vice-president and general manager of the property recently acquired by the Electric Bond & Share Company at Miami Beach, Fla.

L. D. Albin, who was elected vice-president of the Ingersoll-Rand Company in charge of European sales, as was announced in the June 7 issue of the ELECTRICAL WORLD, is at the present time in Europe, where he will spend a considerable part of his time in the future, performing the duties of his new office. Mr. Albin's headquarters are in London.

J. W. Merriam, secretary of the Lincoln Electric Company, Cleveland, was elected president of the Cleveland Association of Credit Men at the recent organization meeting of the new board of trustees. Mr. Merriam had been first vice-president for two years and served as chairman of the adjustment bureau committee two years ago, when the management was reorganized.

H. H. Brown, formerly assistant purchasing agent of the J. G. White Engineering Corporation, has been made purchasing agent of the Associated Gas & Electric Company, with offices in Oneonta, N. Y.

Obituary

Henry C. Egerton, formerly general manager of the Edison Storage Battery Company, West Orange, N. J., and an inventor of some note, died on February 18. Mr. Egerton was connected with the Western Electric Company, New York, for many years in various capacities, during this period contributing numerous inventions to the industry. After severing his connection with the Western Electric Company he formed a company of his own and in 1920 became general manager of the storage battery company in West Orange. Mr. Egerton was a graduate electrical engineer.

John Emory Meek, a vice-president of Johns-Manville, Inc., New York, died recently at White Sulphur Springs, W. Va. Mr. Meek had been identified with the Johns-Manville company since its organization in 1902. He formed the railroad and United States government department of this company in 1906, serving as general manager of them until last March, when he was promoted to the office of vice-president. He was also a director of the company. In earlier life, after spending seven years with the Pennsylvania Railroad at Altoona, Pa., Mr. Meek went to Denver, where he remained for six years, the last three of which he was chief engineer of power plant. He entered the service of the H. W. Johns Company, New York, in 1894 and joined the new organization of the H. W. Johns-Manville Company in 1902. Mr. Meek was a native of State College, Pa.

Donald McDonald, vice-president and general manager of the Louisville (Ky.) Gas & Electric Company, died on Tuesday, June 3, after an illness of only a day. Death resulted from an apoplectic stroke received while delivering an address on the previous Monday. Mr. McDonald had been associated with gas and electric utilities for more than thirty years. A Virginian by birth, he attended Washington and Lee University before going to Louisville, where he became a prominent figure in utility development. He entered upon his career in the public utility field in 1891, when he engaged in some special engineering work for the Kentucky Rock Gas Company, which furnished natural gas to Louisville. One year later, when the company was reorganized as the Kentucky Heating Company, he became president. Later he helped to organize the Kentucky Electric Company and was president during the first two years of its existence. It was in 1913 that H. M. Byllesby & Company consolidated all the competing electric and gas companies in Louisville into one utility and Mr. McDonald was elected vice-president and general manager. Mr. McDonald was sixty-six years of age.

Commission Rulings

No Comparison of Rates Between Companies Operating Under Dissimilar Conditions.—In its hearings on the application of the Southern Power Company for better rates (see ELECTRICAL WORLD, January 19, 1924, page 153, and February 16, 1924, page 355), the North Carolina Corporation Commission held that the rates of one electric utility cannot be justly used to measure the return which investment in another is entitled to earn, when there is not a uniformity of conditions under which the service of each utility is rendered, and when the rate schedules of one are simply stated while the schedules of the other are complicated with an element of maximum demand. A state, in exercising its right of regulation of monopoly in public service to prevent the charging of excessive rates, the commission further observed, gives bond of its character to permit the use of such rates as will yield a fair return under economical management.

Paralleling of Telephone Lines Prohibited Where Alternative Route Exists.—The Nebraska State Railway Commission has affirmed its original decision in denying to the Western Public Service Company of Colorado Springs, Col., authority to construct a transmission line along a certain highway between Auburn and Brownville for the reason that an alternative route is in existence which is reasonably adapted for the use of the power company and which does not involve the necessity of long parallels with important telephone circuits. "We have here," the commission said, "the question of a reasonable application of the rule of the commission that it will not authorize the construction of a high-voltage transmission line where important telephone circuits will be involved in parallel for substantial distances provided that a reasonable alternate highway exists. . . . An extensive parallel with the toll circuits to Brownville and Peru would be created by the proposed construction. It would also be necessary to metallize the grounded farm lines involved in parallel at a substantial cost. . . . A monetary measure of these things is not the only consideration. The communication service, with its outside connections, of a large number of residents in this locality is important and will be affected by the proposed construction on the north road. If the local lines are metallized, an additional burden in the way of rates will come to an entire community. The advantages of the new service would be available only to a small number of the subscribers. The long parallel with the toll lines which connect the villages and towns cannot be avoided." A minority commission opinion was drawn up, concerning which the ruling decision said: "The minority opinion does propose to settle a very perplexing question in the proposed requirements that telephone companies must make rural lines metallic whenever essential to continued good service by reason of proximity of later-coming power lines. This question has been presented to the commission many times, but its determination has not been essential to the settlement of controversies thus far, nor should the commission offer any final suggestions as to the equities until the problem has to be solved. Certainly it is not a matter which can be decided hastily and lightly. "It is quite beside the point," the commission's spokesman concluded, "to discuss whether inductive interference will result if applicant's desired route is approved. Many volumes of testimony are in the commission's files on this subject, and views are widely divergent. That inductive interference does exist is certain. The extent of the interference with signal circuits is in dispute, but as I read the record the rule of the commission is not under dispute, and our conclusions must be based purely on the question whether the so-called south road is reasonably available."

Recent Court Decisions

Proper Allowance for Obsolescence Insisted On.—The Pacific Gas & Electric Company of San Francisco has won a suit involving gas rates by a majority decision in the United States Supreme Court, reversing that of the lower court. Associate Justice McReynolds held that the lower court failed to allow proper value for the company's patents and failed also to make proper allowance for loss due to obsolescence resulting from the introduction of patented processes.

United States Supreme Court Decrees that Utility Need Not Exhaust Remedies Under State Law Before Appealing to Federal Court.—The United States Supreme Court has reversed and remanded for further proceedings in the federal district court cases involving efforts of the Pacific Telephone & Telegraph Company and the Home Telephone & Telegraph Company of Seattle to secure higher telephone rates in the State of Washington. The companies alleged that the rates were confiscatory and gave notice of higher tariffs. After a hearing before the Department of Public Works of Washington permission to increase the rates was refused. The companies applied to the federal court for an injunction to prevent the department from interfering with the increased tariffs. On the ground that the companies had not exhausted legal remedies to secure a revaluation of their properties under state laws, the District Court refused the injunction and dismissed the bill. The Supreme Court, speaking through Chief Justice Taft, holds that the companies were entitled to relief under the federal laws upon establishing sufficient proof of their contentions. The case now goes back to the District Court for action in conformity with this opinion.

Canadian Insurance Company Recovers from Light and Power Company.—The Quebec Court of Appeals has confirmed a decision of the Superior Court ordering the Compagnie Electrique des Laurentides, which supplies electric power in the district of Joliette, to pay damages in the sum of $800 to the Compagnie d'Assurance Mutuelle of the parish of St. Alexis to reimbuse it for a payment to a policy holder for the destruction of his barn through fire. The Court of Appeals said that the only question to be decided was whether through a defect in the system of distribution a current of 6,600 volts was received by the wires in the barn, designed to carry only 110 volts. Holding this to be established, the court decreed that the power company and not the insurance company must be the ultimate loser.

Municipal Contract for Delivering Energy at Corporate Limits Exempt from Law that Rates Must Be Fixed by Ordinance.—The Supreme Court of Iowa has refused to declare void a twenty-year contract entered into by the incorporated town of Sibley with the Ocheyedan Electric Company and the towns of Harris and Lake Park to supply them with electrical energy at a rate agreed upon. Suit was brought against the town of Sibley by one Meader and others, who claimed that this contract had been taken at a confiscatory rate and that in consequence the residents of Sibley were forced to pay higher charges than would otherwise be the case. The court held that under the Iowa law the contract was valid, it being not for the sale of energy within the municipality, in which case an ordinance fixing rates would have been compulsory. That the meter through which the current passed to the transmission line was installed a few feet within the corporate limits was held not to alter the case. (198 N. W. 72.)*

Duty of Company to Inspect Transmission Wires After Violent Storm.—In Schrull vs. Philadelphia Suburban Gas & Electric Company damages were claimed for injuries to a boy from a fallen wire which had been strung close to a thoroughfare. Two violent thunderstorms within twenty-four hours had taken place, and a defect in the line was, according to testimony, plainly visible, though the wire had fallen only a short time before the accident. The Supreme Court of Pennsylvania declared that an electric company is under obligation to inspect its wires in settled communities following storms and that this obligation is not met by a general practice of examining the wires three times a week. The absence of notice that a wire had fallen did not relieve the company from the responsibility of making its own investigation to determine possible breaks, and the question whether a proper inspection had been made was rightly submitted to the jury. A company is entitled to fair time and opportunity to correct defects, but what proper vigilance is is a jury question. (124 At. 141.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Manufacturing and Markets

Devoted to the Discussion of Business and Economic Problems of the Producer and Distributor, with Market Reports, Trade Activities, Foreign and Construction News

The Exchange of Patent Licenses

Former President of Bell Telephone System Discusses Patent Monopolies and Decries Talk of Patent Licenses

IN A RECENT Aldred lecture at the Massachusetts Institute of Technology Frederic P. Fish of Boston, former president of the Bell telephone system and a patent lawyer of national reputation, outlined the development of the patent system of the United States in relation to the engineering industry. In the course of his remarks Mr. Fish pointed out that popular feeling against so-called monopolies in restraint of trade did not for a time go so far as to oppose the beneficent monopoly of a patent, but it does have the effect of limiting to some extent the inclination and the willingness of patent-owning concerns to get together and exchange licenses on proper terms, giving to each a return for the effort put forth.

This tendency, he said, is a most unfortunate element in the present manufacturing situation. In accordance with the principles of the patent system and in order that there may be the industrial development required by the spirit of the times, there should be the same full opportunity for patentees to get together on a proper basis. Mr. Fish urged the avoidance of undue restriction upon the exchange of patent licenses, maintaining that there is too much of a tendency in this direction. The courts have not gone very far yet in the wrong direction, but there is danger, if public sentiment does not change, that harm will be done to the patent system because of the failure to recognize the tremendously beneficent character of this particular monopoly as compared with the monopolies that were suppressed in former times.

Public Has Not Suffered

The spirit of invention has been fostered by the business organization back of every industrial effort and by the patent system from the beginning. This is largely responsible for the fact that the United States has led the world in mechanical and industrial development based on the applications of the discoveries of science to the useful arts. The public has virtually never suffered because of rivalry of patents. There have been fierce patent suits and cases where the public for a time has been unable to use a device because it would infringe some other patents, but in time rival patents have been brought into a common pot and the field opened for more extensive development.

In the electric lighting field it took a long time to bring about the results needed for pioneer development. There were a dozen or twenty companies that started in to build electrical machinery after Edison's wonderful invention of the incandescent lamp, with a resulting state of patent confusion which was intolerable. "I first had my connection with electric lighting in 1882," said Mr. Fish, "and for years there was nobody using an electric plant in this country who did not infringe somebody's patent. No manufacturer could go ahead with any assurance that he was not going to be stopped, and the engineers had to devote their time and attention not so much to getting out good apparatus as to avoiding the other man's patents.

"Now that is an incidental evil, but it was stopped, first, by the organization of the General Electric Company, which took care of several companies, and then by a contract with the Westinghouse company, which practically solved the situation. And when that contract was made in 1896 for exchanging licenses for the first time it was possible for the business to develop on a sound basis, because then the engineers could go to work and they could build the best possible apparatus for any conditions, having the right to do it. Then the executives and the financiers could stake their energy, their time and their money in facing the proposition on its merits.

"Some people have been foolish enough to say that this illustrates the desirability of forcing licenses, of having what they call compulsory license systems. That is perfect nonsense because a compulsory license system takes away the one thing that makes regular development in accordance with the orderly laws of human nature necessary and certain. That is, if business men and inventors should be forced to allow other people to use their inventions, there would be no control whatever, nothing would happen and there never would be this development.

Patents Develop Industry

"What is the reason for this tremendous development? Take the electrical industry, which has become so conspicuous in these few years. It was the knowledge possessed by every man and every company that he, if it were an individual, or the concern, if it were a corporation, might get up a series of patents that would give reasonable control which induced him or it to spend the hundreds of millions of dollars in research, in investigation, in design, in organization that were absolutely essential in order to make it possible to overcome the tremendous difficulties that have been overcome in that industry. The same is true of every other industry. And if we had had any such thing as compulsory license or the working clause that they talk about, the art would have stopped and there would not have been any progress."

Bolivia Planning Mercantile Exposition

FOR the formation of a permanent officially approved exhibition of foreign merchandise in La Paz, Bolivia, in connection with the celebration of one hundred years of independence, Gonzales y Cia, Mercado 167, La Paz, are forming a syndicate

to carry on an "Exposicion Mercantil Permanente" commencing August 6, 1925, according to the International Trade Developer, Inc., 4352 Grand Boulevard, Chicago, an organization interested solely in the development of foreign trade in general.

For American manufacturers desiring to display merchandise the rates are $2 per month per square foot of space taken, payable in advance for a period of not less than a year. In return the exposition will demonstrate to the public the goods on exhibition and quote prices and terms of payment. Since electrical development in South America is fairly recent, this might afford further opportunities for American electrical manufacturers to display their wares and obtain representation.

Too Much Service on Appliances

A Frank Discussion of Present Weakness, Particularly as Concerns the Electric Range, and What It Means to the Contractor-Dealer

BY J. P. COLLOPY
Electrical Engineer, Fort Collins, Col.

I AM going to discuss for a minute the harm that the need for too much service on electrical appliances —principally the range—is doing to the development of the market. I am going to speak frankly. I do not want to "pussyfoot" into the matter as I believe there is already too much of this being done for the good of engineering. Briefly I may say that I have reached this point of view after running a shop for several years. Also, I have discussed this matter many times with repairmen and dealers. The vast majority readily agree with me.

It is not my wish to be regarded as a chronic "knocker" against the electric range. There is little doubt that it has a great future, and I know that at the present time it is a very important factor in the building up of central-station loads. I feel that its possibilities have hardly been touched if it is properly developed, for think of the rural districts, where gas distribution is out of the question and a cool kitchen is more urgently needed than in the city. The electric range in its present state of development, however, is hardly dependable enough for the farmer's use. The fundamental principles of the range appear to be correct-heat insulation, "Nichrome" wire, convenience, etc. It seems a pity then that the small details have not been developed, and I believe that a more dependable range is to be sought for rather than a cheaper one.

Years of experience have shown me, much to my sorrow, that this matter of service is a very serious matter with the contractor-dealer. We do not hear so very much about service when an electric motor is sold. A few years ago there was a great deal said about service in connection with the automobile. But a few years of intensive engineering and testing have placed both the automobile and the electric motor where great stress is no longer necessary on the word "service." Yet every dealer in household appliances hears this gospel of service preached to him by the jobber and manufacturer until he almost believes that his success depends almost directly upon the amount of service that he gives, and if he is not careful he soon finds his entire time taken up with "service" with no time for new business. This overemphasis of service sounds to me like a mark of imperfection in the range.

Service to appliances today consists of a great many things. The electric range calls for more than its share. It seems to furnish a continual round of burned contacts, broken elements, broken switches, thermometers and so on. The housewife often says: "I like my electric range very much when it works, but it is out of order so much that I can hardly depend on it." The dealer feels that it is necessary for him to keep her satisfied if he wishes to sell any more ranges, but if he has had any experience, he knows that he has a difficult task.

In a great many heating elements a small iron machine screw is used as a binding post for terminating the resistor wire. These binding posts often cause more trouble than the whole remaining part of the range. The resistor wire is bent around the bolt and tightened down between two washers by means of a nut. This may make a fair contact when new, but heat and moisture cause it to loosen and arcing sets in and soon fuses the resistor wire. If the washers and underside of the nut were polished, it would banish a great deal of this trouble, and it seems as though a little research would produce a better binding post of a material more suitable than the ordinary iron machine screw. To avoid this trouble some manufacturers have brazed the terminal to the resistance wire. This would apparently be an ideal method, but in many instances the joint is so poorly made that it causes a great deal of trouble.

The mechanical construction of the heating units is often so weak that the accidental dropping of a cooking utensil will break one down, necessitating a new unit. The snap switches controlling the heating units are often a weakness. The contact area seems to be sufficient, but the mechanical construction in general is poor, falling to pieces from hard use, the insulation deteriorating from liquids getting into it and other such troubles arising. To further lessen the dependability of the range automatic devices of poor design are often added. These soon begin to work poorly, causing dissatisfaction and giving the service man a great deal of work. I do not like to swing the hammer too much, but I see no need of hunting up instances where the electric range has gone through fires and earthquakes when the ordinary repairman knows that very often it will not stand up before the onslaught of an even-tempered cook.

APPLIANCE PLUG ALSO WEAK

The smaller heating units come under the same general criticism as the range except that they come nearer to meeting expectations. The electric flatiron using the best grade of resistance wire is in a way quite satisfactory, but a great deal of trouble is caused by poor contact in the plug, the soft, crumbly composition from which the plug is made and a poor cord. In fact, these faults may be found in a great many electrical appliances. If they were remedied, the life of the average dealer would be much happier and, needless to say, his business more profitable. Why a manufacturer puts a poor, unstaple composition in a plug when a good composition can be had for a few cents more is beyond the comprehension of some of us.

I remember an incident that happened some time ago in the drafting room of a large manufacturing plant

that illustrates one great fault in the design of electrical appliances. A draftsman was designing a steam cylinder for an agricultural machine. The foreman came around and told him that his cylinder-head bolts were too small. The draftsman explained that he had considered the pressure, area, shock, etc., and that they were ample. The foreman's reply was that if in this particular machine he had considered the turning power of a 200-lb. man on the end of an 18-in. monkey wrench he would have come nearer to the correct diameter. Just so, if our electric ranges were designed to withstand the dropping of an iron skillet upon the heating units or the pouring of a batch of melted fudge over the surface of the stove, the contractor-dealer would not hear so much about the necessity for service. And the same thing is true of other appliances.

Business Conditions

A Survey of Important Developments in the Electrical Market Including Data on Production, the Sales Outlook, Credits, Exports, the Metals and Other Conditions Affecting Cost, Supply and Demand

STEADY volume of business is reported generally throughout the electrical trade this week, with little change. The business outlook continues the active topic of conversation, the general opinion being that the passing of the political conventions will have a good influence and that, though business may be expected to fall off still more, taken as a whole the year should not show any great decrease under 1923. The fact that the building-hardware industry reports more business on the books and under contract today than ever before indicates a large amount of building still to be done. Meanwhile the volume of business transacted by the larger manufacturers is being maintained. A disposition toward cautious buying has been evidenced by some utility companies, but a number of important new projects are under way and the general expansion program shows no abatement. Demand on the jobbers continues active with perhaps a tendency toward smaller though well-diversified orders.

Competition has been sharp this week in New England with a fair volume of sales, though appliance business has been slow. In the New York district railroad buying has been the strong note of the week, business being spotty but holding up well. Sales to central stations in the Southeastern states average better than last year. Bad weather and depression in the textile industry, however, have influenced retail sales adversely. In the Middle West labor troubles have slackened building activities and slowed down the electrical business, and high-tension and distribution sales to central stations have ranked first this week. Conditions on the Pacific Coast continue dull. Building permits in Los Angeles have fallen off 50 per cent and retail sales are not encouraging. Industrial business, however, is good.

Electrical Exports Show 28 per Cent Increase

PRELIMINARY figures of the Department of Commerce for the month of April show United States exports of electrical material valued at $7,420,420, compared with $5,967,647 shipped during the same month of 1923. This brings the total for the first four months of 1924 up to $29,463,892, an increase of 28 per cent over shipments for the same period of 1923, which were valued at $23,011,783.

The heaviest increases were in transformers, power switchboards, high-tension switching equipment and lightning arresters. Large shipments of railway motors also took place. Another item which made an unusual advance during April was electrical carbons, including electrodes. A steady increase in the exports of appliance lines and radio apparatus is also noticeable.

Trend to Heavier Equipment in Industrial Electric Truck

THE demand for electric industrial trucks has fallen off somewhat in line with the slowing down of industry in general. However, during the first four months of the year sales were very steady and considered by manufacturers as substantial. There has been a tendency toward heavier equipment and a call for more and better material. There has, therefore, been a tendency toward slightly increased costs. There is however, no present likelihood of an increase in price. Keen competition has resulted from the advent of many new concerns in the industry, which have sold at low prices in order to secure their initial business. This, of course, is something not peculiar to the industrial truck industry.

As the industrial electric truck has very frequently been confused with the electric vehicle, one manufacturer has made the suggestion that the name

VALUE OF ELECTRICAL EXPORTS FOR APRIL, 1924, COMPARED WITH CORRESPONDING MONTH IN 1923

	April 1923	April 1924
Generators:		
Direct-current:		
Under 500 kw.	$88,667	$140,915
500 kw. and over	57,497	109,693
Alternating-current:		
Under 2,000 kva.	9,846	30,598
2,000 kva. and over	259,453	58,545
Steam-turbine generator sets	*	405
Accessories and parts for generators	72,040	32,589
Self-contained lighting outfits	53,812	58,778
Batteries:		
Flashlight	*	90,965
Other primary	112,220	70,419
Storage	211,249	246,219
Power transformers	255,790	302,024
Other transformers	40,012	285,399
Rectifiers, double-current and motor generators, dynamotors, synchronous and other converters	89,626	122,902
Switchboard panels, except telephones	190,198	259,593
Switches and circuit breakers over 10 amp.	182,256	263,325
Fuses and fuse blocks	26,601	25,834
Watt-hour and other measuring meters	50,341	30,116
Volt, watt and ampere meters and other recording, indicating and testing apparatus	74,712	100,829
Lightning arresters, choke coils, reactors and other protective devices	29,265	108,286
Motors under 1 hp.	277,178	168,892
Stationary motors:		
1 to 200 hp.	259,967	214,738
Over 200 hp.	8,462	76,189
Railway motors	3,408	112,278
Electric locomotives:		
Railway	242,177	213,196
Mining and industrial	86,474	61,051
Other motors	19,608	†
Starting and controlling equipment:		
Industrial motors	*	106,170
Electric railway and vehicle	*	1,327
Rheostats, controllers and other starting and controlling equipment	147,684	†
Accessories and parts for motors	137,132	171,471
Electric fans	85,002	97,460
Electric lamps:		
Incandescent—		
Carbon-filament	10,161	5,002
Metal-filament	77,138	86,062
Other electric lamps	21,012	22,472
Flashlights	48,183	62,547
Searchlights and projectors	18,820	17,700
Motor-driven household devices	91,263	107,183
Domestic heating and cooking devices	48,122	84,861
Industrial electric furnaces and ovens	12,514	20,450
Therapeutic apparatus, X-ray machines, galvanic and faradic batteries	71,216	99,797
Radio and wireless apparatus	244,270	299,903
Telegraph apparatus	30,843	24,880
Telephone apparatus:		
Magneto telephones	20,054	29,505
Other telephones	10,887	71,743
Magneto switchboards	2,639	.....
Other telephone switchboards	4,341	88,927
Other telephone equipment	*	236,756
Railway signals, switches and attachments	39,964	86,609
Bells, buzzers, annunciators and alarms	13,435	16,287
Spark plugs, magnetos and other ignition apparatus	132,335	268,752
Insulating material	157,605	111,867
Metal conduit, outlet and switchboxes	41,476	43,306
Sockets, receptacles and lighting switches	76,813	107,847
Other wiring supplies and fixtures	158,262	†
Electric lighting fixtures, interior and street	*	45,809
Other wiring supplies and line material	*	113,613
Other electrical apparatus, not elsewhere specified	706,393	763,628
Globes and shades for lighting fixtures	34,340	32,217
Electrical glassware, except for lighting	13,401	23,800
Electrical porcelain	122,489	160,837
Electrical carbons, carbon brushes, electrodes	151,592	303,293
Insulated wire and cable (iron and steel)	58,313	44,911
Other manufactures of aluminum	49,906	54,412
Copper:		
Bare wire	158,230	153,645
Insulated wires and cables	270,943	271,588
Total electrical machinery and apparatus and supplies	$5,967,647	$7,420,420

* Not separately stated prior to January, 1924. † Discontinued beginning January 1, 1924

"tructor" be used as designating an electric industrial storage-battery-driven truck or tractor. Owing to the classification given the industrial truck, the industry has been greatly handicapped by high freight rates and this has also resulted in the improper classification of the industrial truck for export.

There are so many branches of the industry to serve, most of which require entirely different building construction, that so long as the industrial-truck industry must build equipment to suit all of them, just so long will the manufacturer be required to build special equipment. One company says that it does not believe that four or five types will ever fulfill the requirements and provide a sufficiently complete line to enable it to capture its share of the business. It is felt that, aside from the various units which are common to all types of trucks built by any particular manufacturer, the industry is actually getting further away from standardization of units today. Deliveries depend at present largely upon the character of material purchased and upon the number of previous orders taking precedence, but in general are considered fair.

Metal Market Dull—Prices Show Little Change

THE total value of business transacted in the metal market this week has been less than the current rate of production and no price changes of importance have occurred. Consumers are purchasing for current requirements only and in almost all cases have no stocks.

While 12⅞ cents has been the level at which most producers have quoted copper during the week, some sales were made at slightly higher figures, but on Tuesday and Wednesday it was possible to obtain the metal at 12⅝ cents. Copper statistics for May show that there is a lack of any sign of a decreased rate of production.

NEW YORK METAL MARKET PRICES

	June 4, 1924 Cents per Pound	June 11, 1924 Cents per Pound
Copper, electrolytic	12⅛	12⅛
Lead, Am. S. & R. price	7.00	7.00
Antimony	8⅛—8⅛	8⅛
Nickel, ingot	27	27
Zinc, spot	6.10	6.15
Tin, straits	41⅞	42
Aluminum, 98 to 99 per cent	28	28

Although the official price of the American Smelting & Refining Company for lead remains at 7 cents, other sellers are asking higher prices, and as high as 7.35 cents, New York, has been paid for several carloads in the last two or three days. Sales have been fairly good, and although the trend of prices has been upward, consumers are still purchasing cautiously.

Business Spotty in New York District—Volume Good

BUSINESS in the New York district is spotty, but the volume is still considered as holding up well. While orders from the utilities have shown a falling off, several railroads have entered the market and have placed interesting orders for pole-line material and hardware and other apparatus. Industrial companies are purchasing lightly and are observing the strictest economy. Quotations are subject to careful scrutiny and orders are being placed only when it is found impossible to obtain the apparatus at a lower price. This is resulting in considerable price cutting. It is interesting to note that, along with a reduction in prices of watt-hour meters announced the latter part of last month and approximating 8 per cent, the demand for 10-amp. single-phase meters is increasing and is now greater than the demand for the 5-amp. type, the ratio being approximately 60 per cent to 40 per cent. This is certainly an indication of the greater use being made of household appliances.

There are many big projects under way, orders for which are being placed. Among these, for instance, is the Staten Island Edison Company, which is extending its present plant to take care of the Staten Island Railroad electrification. Two machines have been purchased for the New York Edison Company's Fourteenth Street power plant and the order for a third is expected to be placed within the next two or three months. There are also other developments.

Jobbers report that although business is approximately the same in volume as last year, the majority of present orders are coming from contractors in resorts and suburban places, little business being received from the cities.

Demand Irregular in New England —Pole-Line Material Active

A BETTER tone in the purchases of smaller industrial concerns was prominent in the New England trade this week. Business is widely scattered and is still being conducted on a narrow margin of profit. Collections are sluggish in depressed industries such as textiles and leather. A fair general volume of sales is being handled by jobbers, but competition is sharp and the demand is irregular. Central-station energy sales are holding up or increasing, but even the more progressive organizations are reporting a slow movement of appliances with the exception of electric ranges in the eastern Massachusetts territory.

New power business is dull, although some inconspicuous motor sales are in progress here and there. The demand for synchronous clocks is very active, according to a local manufacturer who expects to enlarge his plant soon. Pole-line material is active and manufacturers of this material are busy filling back orders. There is a general feeling that improvement in New England business as a whole will shortly be apparent.

Labor Retarding Expansion in Middle West District

CENTRAL-STATION construction continues to be the prime factor in maintaining the volume of business. While construction work is progressing, labor difficulties have had a retarding influence on expansion plans. In some cases expansions are being temporarily held in abeyance. Three hundred caisson diggers are at present tying up construction work valued at $25,000,000, and structural iron workers threaten to abrogate their present agreements, demanding an increase of 25 cents per hour. Other unions are watching the structural iron workers and will in all probability follow their lead. The electrical trade is very much interested in the situation, as a continued tie-up in building activities would reduce the demand for building material.

Distribution equipment is most in demand, although central-station maintenance purchases are also helping general business conditions. High-tension equipment sales, as was the case last week, were also particularly good. The jobbing trade reports a fair week comparable with last. Probably just as many orders are being received, but the quantities are smaller. The apparent tendency in a number of large institutions is to buy for thirty-day requirements only.

Textile Curtailment and Weather Unfavorable to Southeast

UNSEASONABLE weather conditions, together with curtailment of textile operations and the consequent increase in unemployment in the Southeastern district, continue to keep down the volume of retail sales, particularly in the smaller centers. Despite this fact, the electrical jobbing business is holding up well and has even exceeded sales estimates made several weeks ago. Central-station construction continues to require satisfactory quantities of poles and allied materials, and the sales of distribution transformers are reported as being in excess of a year ago. Sales of motors up to 50 hp. in size have shown some improvement in the past few weeks.

The movement of residential and commercial lighting fixtures is showing a continual gain each month. Optimism is reflected in the reports by electric truck interests of excellent sales prospects in Florida and in the New Orleans and Birmingham districts.

Trade Dull on Pacific Coast—Industrial Business Good

A COMPARATIVELY small and scattering volume of business is reported as having been transacted on the Pacific Coast during the last week. The values of building permits for May, 1924, for Los Angeles, San Francisco and Oakland, as compared with May, 1923, show that while San Francisco permits display a slight increase and Oakland permits a slight decrease, the permits for Los Angeles indicate a decrease of slightly more than 50 per cent. With this falling off in building there has also been a comparative reduction in the sale of electrical building material. Industrial business is considered good, and several orders for complete plant wiring have recently been placed. Some good cross-arm and copper-wire orders have also been recorded.

Electrical dealers report that conditions are extremely slow in the central California valley, but hopes of relief are based upon the yield of midyear crops. The water shortage has postponed much power construction and is also reflected in another way by poor business from summer resorts and camps.

Activities of the Trade

Devoted to News of the
Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

Hurley Machine Denies Absorption by General Electric

Reports have been widely published in the newspapers of the absorption of the Hurley Machine Company of Chicago by the General Electric Company, it being stated that the fact that Niel C. Hurley, president of the Hurley company, planned to sail for Europe in July would probably cause negotiations to be concluded soon. Mr. Hurley vigorously denies that there is any truth in the report, and Gerard Swope, president of the General Electric Company, also says that there is nothing in it. The General Electric owns one-third of the stock of the Hurley company.

Westinghouse Receives Two Very Large Orders

A contract calling for $1,500,000 of railway electrification equipment was received today by the Westinghouse Electric International Company from Takata & Company, acting as agents for the Imperial Government Railways of Japan. The contract covers equipment for the extension of electrical service in the vicinity of Tokio.

The largest individual order for insulators received by the Westinghouse Electric & Manufacturing Company was also placed by Gibbs & Hill, consulting engineers, for the Virginia Railways. The order calls for 70,400 standard suspension insulators and 6,100 high-strength insulators at a cost of about $200,000.

Haber Die & Stamping Company Changes Name

The Haber Die & Stamping Company has decided to change its name to the Haber Electrical Appliance Company in order to identify the company with the electrical appliance industry. The management will be under the direction of the same officers as heretofore and no changes will be made in the personnel of the organization.

Westinghouse Electric at Annual Meeting Votes Stock Increase

At the annual stockholders' meeting of the Westinghouse Electric & Manufacturing Company, held June 11, at the main office at East Pittsburgh, the company's authorized capital stock was increased from $125,000,000 par value to $200,000,000 par value. The following directors were elected by the stockholders: Guy E. Tripp, chairman of the board Westinghouse Electric & Manufacturing Company; H. Westinghouse, chairman of the board Westinghouse Airbrake Company; Joseph W. Marsh, president of the Standard Underground Cable Company; Albert H. Wiggin, president of the Chase National Bank of New York, and H. P. Davis and L. A. Osborne, vice-presidents of the Westinghouse Electric & Manufacturing Company, the two latter taking the places of C. Bennett and William H. Woodin, retired.

Wagner Electric to Redeem Bonds Prior to Maturity

The Wagner Electric Corporation has announced that it has voted to call August 1, 1924, its bond maturities due in 1926, amounting to $100,000. This is the first of the bond maturities specified under the conditions of issuance, and calling them at this time apparently indicates that the company's financial position is sufficiently liquid to permit the employment of current funds for this retirement purpose.

General Electric Again Expands Philadelphia Plant

The General Electric Company has awarded a contract for a six-story reinforced-concrete building, 600 ft. x 80 ft., to be erected at West Philadelphia. This building, in connection with two one-story structures now nearing completion, will be the initial development of a plant to be devoted entirely to the manufacture of switchboard devices.

The ultimate development of the plant contemplates erection of two additional similar multi-story buildings, the three buildings to be connected by a multi-story head building. The total area of the new plant will provide about 1,750,000 sq.ft. floor space. The building recently contracted for will be ready for occupancy early in 1925.

Lombard Governor Company Reports Increasing Sales

Sales of hydraulic governors are running about 20 per cent above last year's figures, and inquiries are showing marked activity, according to J. H. Mueller, sales manager of the Lombard Governor Company, Ashland, Mass. While business is coming from many different localities, Mr. Mueller states that the bulk of current orders originate in eastern Canada or the eastern portion of the United States.

The new type "F" Lombard governor has been developed to enable this unit to be manufactured on a quantity production basis, and this equipment, designed primarily for use with vertical wheels but adaptable for horizontal applications, is reported as the most active item in the company's line. Deliveries have been shortened by this provision for standardized application. Central-station buying is dominant in the hydraulic-governor field, although sales are also good in industrial water-power engineering applications.

Freed-Eisemann Alleges Imitation and Obtains Injunction

An injunction asked by the Freed-Eisemann Radio Corporation was signed May 27 by Judge James Van Siclen of the New York Supreme Court, Kings County, against the R. E. Thompson Manufacturing Company of Jersey City. It was alleged by the plaintiff that the defendant was manufacturing and selling radio receivers made in imitation of the Freed-Eisemann model NR-5 neutrodyne set. Both companies are licensed under the Neutrodyne patents and only the question of imitation is involved. It was alleged that the R. E. Thompson Company had placed on the market receivers in which even unessential details of the Freed-Eisemann product had been copied. The effect of the injunction is to prevent the Thompson company from further manufacture and sale of the apparatus which is alleged to imitate Freed-Eisemann receivers until a further hearing.

New Company to Fabricate Steel Structures for Electrical Use

The Transmission Tower Fabricating Company, 1652 Monadnock Block, Chicago, has been organized to manufacture steel transmission towers, masts, substation structures, switch structures, etc. The company will specialize in and devote its entire facilities to serving the central-station industry. It is now ready to go into production at its plant in Joliet, Ill. George H. Truman is president of the company.

General Electric Maintaining Volume of Business

It is estimated that the volume of business transacted by the General Electric Company in the first quarter of the year is being maintained. Orders for the second quarter of the year are expected to about equal those of the first, which amounted to $73,487,903. This means that bookings for the first six months of the year will be approximately $145,000,000, which is at an annual rate of $290,000,000 and compares with $304,199,746 actually booked in 1923.

The Sundh Electric Company, Newark, N. J., manufacturer of electric control apparatus, announces a price reduction ranging from 5 per cent to 40 per cent on slip-ring automatic starters. These starters, as well as the primary-resistance type of automatic starters for squirrel-cage motors, are now available in both open and inclosed types. More comprehensive and descriptive matter has been published covering the starters, full dimensions and shipping weights having been included.

The Silvray Company, Inc., 318 East Twenty-third Street, announces that it is now preparing to put on the market projection types of lamps for various uses, as show-window lighting, signal work and sign lighting, where a strongly concentrated beam of light is desired, and for this type will use a "G" type bulb silvered so as to leave a bull's-eye opening. Since January 1

the company has confined its activities to silvering the bowl of the pear-shaped lamp, by depositing a silver coating on the outside of the bulb, to make a totally indirect-lighting unit without the use of a reflector. These have been manufactured in sizes from 50 watts to 750 watts.

The American Etherphone Corporation, 39 West Milwaukee Avenue, Detroit, a newly organized firm, has taken over the business of the Radio Apparatus Company of that city. The factory and equipment of the Radio Apparatus Company will be utilized by the new company, of which J. W. Keenan is president.

The Coolee Electrical & Engineering Company, Cleveland, manufacturer of electrical appliances, has plans under way for the acquisition of a site at Sandusky, Ohio, upon which a manufacturing plant will be erected. Upon completion of the new plant the company will move its headquarters from Cleveland to Sandusky.

The Diamond Power Specialty Company, Detroit, manufacturer of soot blowers, has appointed W. L. Sullivan, 505 Central National Bank Building, Tulsa, Okla., as representative for Oklahoma.

The International Combustion Engineering Corporation, New York, announces that along with its subsidiaries it has transacted during the month of April, both in Europe and America, the largest volume of business in the history of the company.

L. G. Hawkins & Company, Ltd., jobbers, announced their removal on May 26 last to 30-35 Drury Lane, Kingsway, London, W.C. 2. The new building contains an area of 12,000 sq.ft. and is provided with spacious showrooms and demonstration rooms fully equipped.

The Trico Fuse Manufacturing Company, Milwaukee, manufacturer of renewable cartridge fuses, announces the removal of its New York office to larger and better quarters at 154 Nassau Street. R. F. Waldo is district manager in charge.

The General Electric Company has received an order from the New York Central Railroad for 100 of its new form L-22 floodlighting projectors to be installed in the Selkirk yards.

The Western Gear Works, Seattle, has just manufactured micarta gears for the Washington Pulp & Paper Company that are 6 ft. in diameter and believed to be the largest non-metallic gears yet manufactured. The gears will be installed on the drying section of a 164-in. Bagley-Sewall paper machine used in the manufacture of newsprint.

The Switch Plate Corporation, Norfolk, Va., is now placing on the market a switch plate made from plate glass. It is mirrored on the back and beveled on the sides. The plate is made to accommodate tumbler and toggle switches only and is furnished in gangs of one, two and three.

The Philadelphia Insulated Wire Company, 200 North Third Street, Philadelphia, is now working its plant at capacity, and it is said that there is sufficient business on the books to maintain the present schedule up to July 1. Property has been acquired at Third and Florist Streets, where improvements and alterations will be made for early occupancy to provide for general expansion.

The Premier Storage Battery Company, 7 Skillman Place, Long Island City, N. Y., has plans under way for a two-story-and-basement service and repair building at Jackson Avenue and South Washington Place, estimated to cost $30,000.

The F. W. Wakefield Brass Company, Vermilion, Ohio, announces that its "Red Spot" hangers for commercial lighting service are now available in the 6-in. size with a screwless holder for which many advantages are claimed.

The Electric Storage Battery Company, Philadelphia, announces the declaration of the regular dividend of $1 quarterly, payable July 1 to stockholders of record June 20.

New Equipment Available

Short Descriptions of New Apparatus and Accessory Equipment of Interest to the Electrical Industry and Available from Manufacturers and Announcements of New Lines

Adjustable Insert for Machine Mounting

For fastening machinery or other equipment to concrete floors, walls or ceilings without the use of bolts embedded in the concrete a new adjustable bolt insert has been designed by the Westinghouse Electric & Manufacturing Company. The adjustable insert consists of a cast-iron housing with a tapering body and containing a rotatable bolt carrier. The bolt carrier is T-slotted to take the head of a standard machine bolt and is of sufficient length to permit a ⅝-in. movement of the bolt from the center. The bolt can be adjusted in any direction after the concrete has set. The housing and bolt carrier are provided with teeth which mesh and prevent any change in position after adjustment has been made and before the bolt has been tightened.

Auxiliary Steam Turbine

A line of auxiliary velocity-stage steam turbines, with the casing supported on a single pedestal at a point close to its center line, and with the turbine shaft mounted on two bearings, one at either side of the housing, has been placed on the market by the De Laval Steam Turbine Company, Trenton, N. J. The steam-inlet nozzle, steam chest and governor valves are all included in the upper half of the casing and are readily accessible. Water cooling is not required.

The governor valve casing, the steam chest and the upper half of the turbine casing are cast integral and are made of steel for high-pressure and high-temperature steam. There are no cross-over steam connections. The speed governor valve and emergency trip valve are compactly arranged and are entirely independent of each other. Where the turbine is to be used to drive a boiler-feed pump a pressure-regulating governor can be attached to the casing cover without removing the regular speed governor. The steam-inlet nozzle is alongside the emergency governor valve, and the turbine is protected by a monel-metal strainer in the governor-valve body. Where considerable changes in load or in steam pressure are anticipated, some of the nozzles can be provided with hand-operated valves. All parts entering into the construction of the turbine are made to limit gages, to insure interchangeability of parts.

Sight Tube.—A sight tube of periscope form for determining the condition existing inside the tanks of large oil circuit breakers without the necessity of emptying the oil has been developed by the Westinghouse Electric & Manufacturing Company. At the end of the tube, in a bulb-shaped compartment, a 100-watt, 110-volt lamp is placed so that its rays illuminate the area in front of the lower sighting hole of the tube. A circular mirror, directly above this lamp and opposite a glass-covered opening in the tube, reflects the image of whatever is illuminated by the lamp. The tube is built in three lengths, 5 ft. 3⅜ in., 6 ft. 2 in. and 6 ft. 7 in., depending on the size of the breaker tank.

Volt-Ammeter. — A volt-ammeter known as the Type TD, which is only 3½ in. in diameter, has been developed by the Roller-Smith Company, New York, and is intended for such applications as battery-charging outfits, motor-generator sets, farm-lighting plants and places where space and price considerations call for a combination instrument rather than a separate ammeter and voltmeter. The instrument weighs 1¼ lb. net and has a scale 2.1 in. long. Only ampere and voltage ranges having the same number of scale divisions can be combined. The instrument can also be supplied as a center-zero device if desired.

Floodlighting Projector. — A floodlighting projector with composite reflectors for use in railroad yard illumination, and known as Form L-22, has been developed by the General Electric Company and is now being placed on the market. Ventilation is provided by shielded outlets at top and bottom. The focusing mechanism, of the split ball and socket type, with a single clamping screw, allows movement of the socket in any direction. The two reflectors provided are made from blown glass, silvered and hermetically sealed with a heavy coating of electrolytically deposited copper, covering and protecting the entire outer surface of the mirror. This copper also assists in radiating heat from the lamp. The composite reflectors are said to increase greatly the central beam candlepower and lumens.

New Trade Literature

MICA INSULATION.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a booklet entitled "Westinghouse Mica Insulation" dealing with all forms of sheet, hot-molding and cold-molding mica insulation manufactured by the company.

AUTOMATIC CONTROL SYSTEM.—Harold E. Trent, 1524 Chestnut Street, Philadelphia, is distributing a leaflet covering the "Trent" automatic-control system.

MOTORS.—The Century Electric Company, 1827 Pine Street, St. Louis, is distributing two leaflets, one covering the use of the "Century" electric motors with pumps and compressors, the other dealing with mechanical refrigeration equipment. "Preventing Complaints Versus Satisfying Complaints" is the title of third leaflet issued by the company on starting and operating motors.

VALVES.—The Edward Valve & Manufacturing Company, East Chicago, Ind., now has ready for distribution a new catalog No. 8, which is fully descriptive of the company's line of valves.

SMALL MOTORS.—Bulletin No. 204 issued by the Ohio Electric & Controller Company, 5900 Maurice Avenue, Cleveland, describes the "Ohio" fractional size alternating-current and direct-current ball-bearing motors. The company is also distributing a bulletin on motor applications, which gives illustrations of its various uses.

LUBRICATION.—The Waverly Oil Works Company, Pittsburgh, is distributing a booklet entitled "Industrial Lubrication" which contains lubrication data for industrial machines with lubrication charts. It also gives recommendations for the lubrication of all standard makes of machines and engines.

WATER SOFTENER.—The Graver Corporation, East Chicago, Ind., has issued a booklet containing the report of an investigation made by the A. C. Neilsen Company of the "Graver" hot-process softener in use by the Independent Pneumatic Tool Company, Aurora, Ill.

SWITCHES, CUT-OUT BOXES, CABINETS, ETC.—The Federal Steel Products Company, Inc., 2-14 Avenue L, Newark, N. J., is distributing catalog No. 2, covering its products, including externally operated switches, safety switches, panelboard cabinets, cut-out-boxes, etc.

ICELESS REFRIGERATOR.—Copeland Products, Inc., Flint, Mich., has published bulletin No. 201, covering the "Copeland" iceless refrigerator.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Manzanillo, Mexico (No. 10,480), for dry-cell batteries, size No. 6, and for radio sets.

Purchase is desired in Montevideo, Uruguay (No. 10,501), of copper wire and cable, 15,000 kilos of each.

Purchase is desired in Glasgow, Scotland (No. 10,479), of crystals for radio sets.

An agency is desired in Melbourne, Australia (No. 10,481), for electrical appliances.

An agency is desired in Cairo, Egypt (No. 10,482), for electrical appliances and telephone apparatus.

Purchase is desired in Chihuahua, Mexico (No. 10,492), of ornamental street and park lamps.

An agency is desired in Alexandria, Egypt (No. 10,476), for all kinds of electric generators and motors, electrical materials, etc.

Purchase is desired in Mazatlan, Mexico (No. 10,475), of radio sets.

An agency is desired in Cadiz, Spain (No. 10,478), for radio and telephone equipment.

Purchase and agency is desired in Santander, Spain (No. 10,516), for electric railway materials and electric and gas locomotives for mines.

An agency is desired in Melbourne, Australia (No. 10,477), for rotary, flush and ceiling switches.

Purchase and agency is desired in Toronto, Canada (No. 10,500), for burner equipment for powdered coal for industrial plants and for small units for house furnaces.

Purchase is desired in Vienna, Austria (No. 10,461), for oil for insulating electric cables.

Martin Diaz de Cossio, Plaza de Cataluna 9, Barcelona, Spain, desires to secure exclusive rights of exploitation and manufacture for small portable electric lighting and power generating outfits suitable for private residences and farm houses.

New Incorporations

THE HOGAN ELECTRIC LIGHT LINE, South Jacksonville, Fla., has been incorporated by S. Ben Skinner, president, and James Blair, secretary.

THE BLACKLINK MUTUAL POWER COMPANY, Rural Retreat, Va., has been incorporated by B. B. Miller and W. R. Brown.

THE NORTH FAIRFIELD LIGHT & POWER COMPANY has been incorporated with a capital stock of $10,000 by L. L. Jones and John E. Hankammer.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

WILTON, ME. — The Wilton Woolen Company, it is reported, is planning to build a hydro-electric plant near its lower mill.

WINSLOW, ME. — The Central Maine Power Company plans to rebuild its Fort Halifax substation, recently destroyed by fire with loss of about $17,000.

PORTSMOUTH, N. H.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, until June 17 for 1,000 canopy switches for the local navy yard (Schedule 2298).

BOSTON, MASS.—The Edison Electric Illuminating Company has filed plans for a transformer substation at 317 Cambridge Street, to cost about $200,000.

LEOMINSTER, MASS.—Plans are under consideration by the Leominster Electric Light & Power Company to erect a 13,000-volt transmission line from the Litchfield station to the station on Mechanic Street, to cost about $60,000.

PROVIDENCE, R. I.—The Atlantic Refining Company, 260 South Broad Street, Philadelphia, plans to install electric power equipment at its proposed local oil refinery at Fuller Rock, to cost about $250,000.

Middle Atlantic States

BEEKMAN, N. Y.—The Harlem Valley Electric Corporation has been granted permission to extend its electric lines into the town of Beekman and to exercise the rights and privileges granted by the Town Board.

BROOKLYN, N. Y. — Electric power equipment will be installed in the proposed public market to be built by the city on the site of the present Wallabout Market, for which an appropriation of $5,000,000 has been made. The Department of Plant and Structures, Grover A. Whalen commissioner, is in charge.

BUFFALO, N. Y.—D. P. Cooper, 217 Summer Street, Buffalo, N. Y., has applied to the Federal Power Commission for a preliminary permit to develop tidal power at Passamaquoddy Bay and Head Harbor on Bay of Fundy in Maine and New Brunswick.

BURDETTE, N. Y.—The Elmira Water, Light & Railroad Company has leased the municipal lighting plant and will furnish service in this district. Plans are under way for extensions in transmission system.

ELMIRA, N. Y.—Steps have been taken by the Main Street Better Business Club to secure an extension of the ornamental lighting system in the business district.

NEW YORK, N. Y.—Bids will be received by the New York Central Railroad Company, Room 344, 466 Lexington Avenue, until June 16 for one 600-kw. synchronous motor-generator set and one 400-amp. balancer set, with switchboard and appurtenances (Serial Contract No. 15-1924). C. S. White is purchasing agent.

NEW YORK, N. Y.—Bids will be received by the Commissioner of Purchase of the City of New York, Room 526, Municipal Building, Manhattan, until June 18, for furnishing electric materials and supplies and lamps to the Departments of Health, Plant and Structures and Police and Fire Departments for the period ending Sept. 30, 1924.

NIAGARA FALLS, N. Y. — The City Council is considering extensions to the ornamental lighting system. W. B. Bennett, Convention Hall, is engineer.

OLEAN, N. Y.—The Olean Electric Light & Power Company plans to extend its transmission line from Olean into Porterville and erect a substation there. The cost is estimated at about $25,000.

PERRY, N. Y.—The New York Central Electric Corporation has applied to the Public Service Commission for authority to exercise electric franchises granted to the corporation by the towns of Ossian, Sparta, Reading, Bath, Wayland and Middlebury and the villages of Almond and Wyoming.

ROCHESTER, N. Y.—The Rochester Gas & Electric Company has applied to the Public Service Commission for authority to extend its electric light and power service into the towns of Canandaigua, Hopewell and Walworth.

ROME, N. Y.—To supplement the present electrical service in Rome, the Northern New York Utilities, Inc., which recently took over the system of the Rome Gas & Electric Company, will erect a 24-mile, two circuit, three-phase, steel tower transmission line from Boonville to Rome, build a substation and equip a switching station at Boonville and construct an additional substation at Rome to take care of additional energy for this district.

SHERMAN, N. Y.—The Niagara, Lockport & Ontario Power Company, Buffalo, is planning to build a substation in Sherman, to cost about $50,000.

WATERTOWN, N. Y. — The Northern New York Utilities, Inc., contemplates a hydro-electric development of from 2,000 hp. to 2,500 hp. at Sewalls Island on Black River, to cost about $250,000.

HASBROUCK HEIGHTS, N. J.—Bids will be received by the board of education, Hasbrouck Heights, until June 19 for furnishing and installing electric automatic time clocks and fire-alarm system in the Franklin School. P. M. Chance is district clerk.

KANE, PA. — The Pennsylvania Plate Glass Company, recently organized by W. A. James, Kane, and associates, plans to build a power house at its proposed sheet-glass manufacturing plant. The cost of plant is estimated at $450,000.

READING, PA.—The Metropolitan Edison Company has taken over and will consolidate the Metropolitan Royalton Electric the Derry Dauphin Electric and the Metropolitan Middletown Edison companies, heretofore operated as subsidiary organizations. Extensions in transmission lines are planned.

BALTIMORE, MD.—Bids will be received by the Board of Awards, City Hall, until June 18 for one motor-driven pumping unit for the Back River sewerage-treatment works. Steuart Purcell is chief engineer.

CEDAR GROVE, W. VA.—The Tompkins Fuel Company, Charleston National Bank Building, Charleston, contemplates the construction of a substation with motor-generator set, etc., at its local plant. Motors for haulage and other heavy service will be installed. Harold P. Tompkins is president.

NORTON, VA.—The Kentucky Utilities Company, Louisville, has acquired the system of the Old Dominion Power Company and will merge with its properties. Plans are under way for extensions in transmission lines.

WARRENTON, VA. — The Virginia-Northern Power Company, recently organized, is reported to be planning to erect a transmission line. Joseph W. Henderson is president.

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, until June 17, for rheostats and adapting parts (Schedule 2288).

WASHINGTON, D. C.—Bids will be received by the General Supply Committee until June 18 for electrical supplies for the next quarter, including conduit, dry cells, condulets, sockets, bells, fuses, switches, wire and cord, fittings, etc.

WASHINGTON, D. C.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until June 23 for cable, wire pneumatic hammers, chuck, fans, tubing, conduit, steel pipe, cable clips, fuses, insulators, lead sleeving, sockets, street-lamp globes, etc., as per circular (1613).

North Central States

DETROIT, MICH.—The City Council has authorized the Public Lighting Commission to take bids at once for the proposed municipal electric generating plant at the foot of Morrell Street, to cost $13,000,000.

GRAND RAPIDS, MICH.—A movement is under way to install an ornamental lighting system on portions of Grandville Avenue, Wealthy, Leonard and Bridge Streets.

TRAVERSE CITY, MICH.—The installation of an ornamental lighting system in the business section of the city is under consideration by the City Commission.

CANTON, OHIO.—The Ohio Power Company has issued $2,000,000 in bonds, part of the proceeds to be used for extensions and improvements.

NORTH FAIRFIELD, OHIO. — The North Fairfield Light & Power Company, recently organized, plans to establish and operate an electric plant here.

OSBORN, OHIO.—Work has started on the construction of the proposed cement-manufacturing plant of the Southwestern Portland Cement Company, El Paso, to cost about $2,500,000. It will be equipped throughout with electrically operated machinery.

WAUSEON, OHIO. — The Lake Shore Power Company has secured permission to acquire the properties of the Toledo & Indiana Light & Power Company, and to purchase the system of the Central Light & Power Company at Edgerton. Extensions will be made in transmission lines.

BOWLING GREEN, KY.—The Kentucky-Tennessee Light & Power Company has applied to the Public Utilities Commission for permission to purchase the municipal electric light plants in the towns of Martin, Dresden, Gleason, Sharon, Greenfield, Dyer, Rutherford, Trimble, Obion and Bradford, all in Tennessee. For a time the plants will be supplied from the steam plant at Hopkinsville, Ky., and eventually will be served with hydro-electric power. The inauguration of the proposed "superpower" in West Tennessee will involve an expenditure of about $500,000. This project, known as group A, will serve a population about 110,000. Group B, which will be projected soon, will include Tipton, Haywood and Lauderdale and surrounding counties.

LOGANSPORT, IND.—J. A. Shafer, Odd Fellows' Building, Indianapolis, has applied to the Federal Power Commission for a preliminary permit for a power project on the Wabash River, near Logansport.

MONON, IND.—The Granolite Corporation, 224 Fourth Street, Milwaukee, manufacturer of Radio apparatus, contemplates the purchase of steam generating and electrical equipment for a new plant to be erected at Monon. Leichenko Eisser, 38 South Dearborn Street, Chicago, are engineers.

SOUTH BEND, IND.—The City Council has given its approval of the new ten-year contract for street lighting with the Indiana & Michigan Electric Company, under the terms of which the company will replace the cluster lamps now in use in the business section with the new Egyptian type of lamp.

GRANITE CITY, ILL.—Preparations are being made by the St. Louis (Mo.) Coke & Iron Company, for the construction of a blast furnace and power plant at its local plant. The power plant will utilize the gas from the blast furnaces to generate electricity, which will be sold to public utility corporations in Southern Illinois. The cost of the project is estimated at about $2,500,000.

FRIENDSHIP, WIS. — The Friendship Electric Light & Power Company plans to build a new dam and power house on the Roche-à-Cris Creek, at Cottonville, to cost about $25,000. The project includes a transmission, 6 miles long, from Friendship to Cottonville.

JUNCTION CITY, WIS. — Plans are under way by the Wisconsin Valley Electric Company, Wausau, to erect a transmission line from Carson to Junction, a distance of 4 miles; also to erect a substation here, to rebuild the local distribution system and establish a twenty-four-hour service.

KEWAUNEE, WIS.—The Wisconsin Public Service Corporation, Green Bay, contemplates erecting a transmission line out of Kewaunee to provide service to the Kewaunee County poor farm and to residences along the line. The cost is estimated at about $5,000.

MADISON, WIS.—Plans are under way by the Wisconsin Power, Light & Heat Company to extend its transmission line to serve rural communities east of Dotyville on the plank road, and also to rebuild the part of its Oakfield line extending south of the county poor farm.

MERRILL, WIS.—The City Council has repealed the ordinance recently passed for an ornamental lighting system and has adopted a new ordinance providing for the installation of ornamental lamps throughout the city. In the business district 400-cp. lamps will be used, while lamps of 250 cp., will be used in the residential and park sections of the city.

MILWAUKEE, WIS.—The Vilet Street Development Association has petitioned the City Council requesting the installation of additional street lamps on that thoroughfare, especially in the district west of Forty-sixth Street, now without lighting service.

MINNEAPOLIS, MINN. — All bids for 42,292 ft. of cable for cable for electric signal system for the Fire Department have been rejected by F. S. Gram, city purchasing agent. New bids, it is understood, will be asked for.

RED WING, MINN.—The Cannon River Hydro-Electric Company, Cannon Falls, is negotiating with the city officials of Red Wing to supply this city with electricity for a period of fifteen years. J. H. A. Brahtz, St. Paul, is engineer.

WINONA, MINN.—All bids have been rejected by the Wisconsin Light & Power Company for the proposed addition to its boiler plant. The cost is estimated at $50,000. Mead & Seastone, Journal Building, Madison, are engineers.

CLERMONT, IOWA.—The Northeastern Iowa Power Company has acquired the system of the Consumers' Power Company, Osage; the People's Power Company, Readlyn, and the Calmar (Iowa) Power Company. The properties will be consolidated, and extensions made in transmission lines.

HUMANSVILLE, MO.—The West Missouri Light & Power Company has purchased the plant of the Sac River Light & Power Company and plans to make extensions and improvements, to cost about $175,000, including the erection of a transmission line to Weaubleau, Fair Play and vicinity.

PERRYVILLE, MO.—Plans for the proposed municipal waterworks and sewer system, to cost about $100,000, include electrically operated pumping machinery. The Burns & McDonnell Engineering Company, Interstate Building, Kansas City, Mo., is engineer.

CHURCHS FERRY, N. D.—The Midwest Power Company, St. Paul, Minn., has authorized surveys for a transmission line from Devils Lake, via Leeds, Oteron, Brinsmade, Minnewaukan, New Rockford and Carrington.

LA MOURE, S. D.—The Ottertail Power Company, Fergus Falls, Minn., is negotiating for the purchase of the municipal electric plant and contemplates the erection of a high-tension transmission line between Fergus Falls, Minn., and La Moure to supply electricity here.

MOBRIDGE, S. D.—The Mobridge Electric Company is considering doubling the capacity of its generating plant and extending its high-tension transmission line to Roscoe, Ipswich and Bowdle, and possibly to Hosmer and Eureka. The cost of the work is estimated at $150,000.

Southern States

BURLINGTON, N. C.—The North Carolina Public Service Company, Greensboro, has acquired the property of the Piedmont Power & Light Company. Extensions in transmission lines are contemplated.

DURHAM, N. C.—Bids will be received by the Mayor and Council until June 26 for waterworks improvements, including a combined pumping and power station, erection of a 22,000-volt transmission line about 11 miles long, installing piping and valves in power house, and installation of substation equipment previously purchased. William M. Piatt is city engineer.

COLUMBIA, S. C.—The Columbia Canal Commission has decided to construct a 500-hp. hydro-electric plant to supply electricity to the state offices and institutions in and around Columbia. The commission will meet June 17 to receive bids and estimates on the engineering costs and to select an engineer to supervise the construction work.

FORT MILL, S. C.—The Southern Power Company, Charlotte, N. C., is considering extensions to its local hydro-electric station on the Catawba River, including enlarging dam and installing additional equipment, to cost about $400,000.

GOLDVILLE, S. C. — Electrical equipment will be installed in connection with the proposed additions to the Banna Cotton Mills. A street-lighting system will also be installed in a community housing development for employees. Lockwood, Greene & Company, Atanta, Ga., are architects and engineers.

NEW SMYRNA, FLA.—The City Council is considering the purchase of equipment for the municipal electric plant, including two oil-burning engines, with generators, 600 hp. and 800 hp. capacity respectively; switchboard apparatus, pumping equipment, etc.

MORRISTOWN, TENN.—Bonds to the amount of $300,000 have been sold for extensions and improvements to the municipal electric plant and for waterworks system.

TREZEVANT, TENN.—The installation of an electric lighting system is under consideration.

EVERGREEN, ALA. — The Municipal Light & Water Company is rebuilding pole-line equipment and installing a motor circuit. S. J. Brundage is manager.

ELK CITY, OKLA.—The Oklahoma Gas & Electric Company, which recently acquired the local plant, plans to install new equipment and to remove all poles into the alleys. Plans have been prepared for the installation of an ornamental lighting system, subject to approval of the City Council.

Pacific and Mountain States

KELSO, WASH. — The North Coast Power Company has been granted a franchise by the County Commissioners to erect transmission lines on highways outside the city limits.

SEATTLE, WASH.—The Department of Lighting is considering the erection of a service and operating building for equipment, repairs, etc., for the municipal lighting plants, to be located at Fourth Avenue, South, and Spokane Street, to cost about $250,000.

SEATTLE, WASH.—Under the direction of Hubbell & Waller, Alaska Building, Seattle, Wash., engineers, construction will be started on a hydro-electric power plant on Crystal Lake, Alaska, to cost about $115,000. The name of the owners is temporarily withheld.

TACOMA, WASH.—Bids will soon be asked for the construction of a power plant on the north fork of the Skokomish River, in connection with the Lake Cushman municipal power project, to cost about $250,000. J. L. Stannard is chief engineer.

BEND, ORE. — Application has been made by the Pringle Falls Electric Power & Water Company, Journal Building, Portland, for a preliminary permit for a power project on the West Fork of Dechutes River.

MARSHFIELD, ORE. — The Mountain States Power Company contemplates the construction of a transmission line to be used in connection with Coos Bay jetty construction, to cost about $18,000.

PORTLAND, ORE.—The Portland Electric Power Company plans to build a substation on Lombard Street, near Macrum Street, to cost about $20,000.

PORTLAND, ORE.—Bonds to the amount of $50,000,000 have been authorized by the Portland Electric Power Company, the proceeds to be used for extensions and improvements during the next six years.

FRESNO, CAL.—The San Joaquin Light & Power Corporation has applied to the Federal Power Commission for a license to erect a transmission line in Kern, San Luis, Obispo and Santa Barbara Counties.

LOS ANGELES, CAL.—Bids will be received by the Board of Public Works until July 21 for lead-covered cable, as per specifications on file.

LOS ANGELES, CAL.—The Los Angeles Railway Company plans to build a substation on Sixth Street, near Central Avenue.

LOS ANGELES, CAL.—A new 20,000-hp. substation, to cost about $200,000, to be located at Vine and Romaine Streets, in

the Hollywood district, will be erected by the Municipal Bureau of Power and Light. It will replace the substations at Santa Monica Boulevard and Van Ness Avenue and at Sunset Boulevard and Cahuenga Avenue.

LOS ANGELES, CAL.—The City Council has authorized the installation of an ornamental lighting system on Atwater Avenue, on Larga Avenue and on Madera Avenue, all concrete standards.

RIVERSIDE, CAL.—The Southern Sierras Power Company has applied to the Federal Power Commission for a license to erect a transmission line, about 17 miles, known as the Cajon-Lime Products extension transmission line, in San Bernardino County.

SAN BERNARDINO, CAL.—The City Council has authorized the installation of an ornamental lighting system on Fifth Street, between D and I Streets, using concrete standards.

SAN FRANSCISCO, CAL.—The lighting committee of the Board of Supervisors is arranging a program for extensions in the street-lighting system, to include ornamental standards on Sutter Street from Market to Van Ness Avenue, portion of Van Ness Avenue, and on Market Street to Valencia Street; also, for ornamental standards in the Chinatown district and an improved system on Mission Avenue between Fourth and Sixteenth Streets.

SANTA BARBARA, CAL. — The City Council is considering a recommendation of Herbert Nunn, city manager, for establishing a municipal electric power plant in the vicinity of the Sheffield Reservoir, to supply power supply for pumping service.

SANTA MONICA, CAL.—The City Council plans to install an ornamental lighting system on Colorado Avenue, Wilshire Boulevard and H Street.

BOISE, IDAHO.—The Utah Power & Light Company, Salt Lake City, has applied for permission to construct and operate a hydro-electric power plant on the Bear River.

WELLTON, ARIZ. — The Gila Valley Power District has applied for a license to erect a transmission line in Yuma County.

YUMA, ARIZ.—The Mohawk Valley Irrigation District, Yuma, plans to install a series of electrically operated pumping plants in connection with an irrigation project to cost about $750,000. L. A. Macy and A. B. Ming are interested in the project.

BUTTE, MONT.—The Great Falls Power Company has applied to the Federal Power Commission for a license to erect a transmission line, about 3 miles long, in Cascade County.

CHEYENNE, WYO.—The installation of an ornamental lighting system on Carey Avenue, to cost about $5,000, is under consideration.

ESTANCIA, N. M.—J. M. Land, El Paso, Tex., engineer, is at the head of a project to construct and operate a steam-operated electric power plant here for commercial service.

LAS CRUCES, N. M.—Plans are under consideration by Stone & Webster, Inc., Boston, who recently purchased the system of the Las Cruces Electric Light & Ice Company for improvements and extensions to cost about $150,000. Further extensions are contemplated during the next thirty-six to forty-eight months, involving an expenditure of about $500,000. A new transmission line to El Paso is under consideration.

Canada

BURNABY, B. C.—Plans are being prepared by the British Columbia Electric Railway Company for an addition to its local Horne Payne substation, to cost about $250,000.

VANCOUVER, B. C.—The Canadian Pacific Railway Company is planning to equip its main line from Vancouver to Calgary for electrical operation. S. E. Jenkins & Company, Ltd., 837 Hastings Street, West, are engineers.

NIAGARA FALLS, ONT.—The Niagara, St. Catharines & Toronto Railway Company (part of the Canadian National Railways System) is planning to rehabilitate the local street-car system, at a cost of about $350,000.

PEMBROKE, ONT.—The Superior Electric Company, Ltd., plans to rebuild its plant, which was recently destroyed by fire, causing a loss of about $50,000.

Electrical Patents

Announced by U. S. Patent Office

(Issued May 13, 1924)

1,493,557. SANITARY TELEPHONE TRANSMITTER SHIELD; A. S. Meadoff, New York, N. Y. App. filed March 29, 1920.

1,493,562. ELECTRICAL HEATING APPARATUS; W. Penzold, Hanover, Germany. App. filed April 18, 1923. For heating liquids providing the electrical resistance for transforming the electrical energy into heat.

1,493,563. FLATIRON; R. M. G. Phillips, New Haven, Conn. App. filed June 22, 1921. With automatic means for shuting off the current.

1,493,571. CONTACT PLUG; A. G. Smith, Chicago, Ill. App. filed May 5, 1922.

1,493,586. MEASURING AND RECORDING DEVICE; E. B. Wood, Chatham, N. J. App. filed Dec. 30, 1922. For continuously measuring and recording values of relative humidity.

1,493,593. ELECTRIC LAMP SOCKET; R. B. Benjamin, Chicago, Ill. App. filed Sept. 27, 1919. Pull-chain type with double break.

1,493,595. AMPLIFYING WITH VACUUM TUBES; D. G. Blattner, Bogota, N. J. App. filed June 4, 1921. Connected in tandem relation and having a common source of space current.

1,493,600. WAVE FILTER; G. A. Campbell, Montclair, N. J. App. filed June 12, 1918. For use in electric line and circuits where it is desired to transmit alternating current of selected frequencies and to suppress or partly suppress currents of other frequencies.

1,493,619. CARRIER TRANSMISSION SYSTEM; L. Espenschied, Hollis, N. Y. App. filed June 13, 1919.

1,493,656. WELDING APPARATUS; E. J. von Henke, Chicago, Ill. App. filed Oct. 20, 1921. For butt welding.

1,493,696. THERMIONIC OR OSCILLATION VALVE; S. R. Mullard, Southfields, England. App. filed Nov. 9, 1920. In which the bulb has a re-entrant portion for supporting an electrode.

1,493,713. VARIABLE ELECTRIC UNIT; J. Tykohinski-Tykociner, Urbana, Ill. App. filed Sept. 11, 1920. As coils, windings and variable inductances for wireless telegraphy and telephony.

1,493,731. ELECTRIC FURNACE; C. A. Cadwell, Cleveland, Ohio. App. filed July 3, 1920. Resistor of granular material employed in conjunction with the plurality of electrodes by which the current is conducted to the furnace.

1,493,733. AUTOMATIC ELECTRIC GENERATING SYSTEM; H. F. Carpenter, New York, N. Y. App. filed July 29, 1920. Internal-combustion engine, generator and storage-battery unit.

1,493,807. CABLE SIGNALING; L. Cohen, Washington, D. C. App. filed March 3, 1919.

1,493,842. ELECTRIC FURNACE; O. A. Colby, Irwin, Pa. App. filed Dec. 17, 1921. Resistance type with special means for mounting the resistor.

1,493,849. ARC-WELDING TRANSFORMER; O. H. Eschholz and A. M. Candy, Wilkinsburg, Pa. App. filed Sept. 25, 1919. Having improved starting characteristics.

1,493,851. SYSTEM OF CONTROL; R. E. Ferris, Edgewood, Pa. App. filed April 12, 1921. For securing substantially constant potential regardless of the speed at which a generator is driven.

1,493,853. POWER TRANSMISSION AND CONTROL; E. M. Fraser, Yonkers, N. Y. App. filed Oct. 30, 1920. By transferring mechanical power to electrical and vice versa.

1,493,857. CARTRIDGE HEATER TERMINAL; L. J. Greenawalt, Mansfield, Ohio. App. filed Sept. 12, 1922.

1,493,859. COLLECTOR RINGS AND METHOD OF MAKING SAME; W. H. Himes, Pittsburgh, Pa. App. filed Feb. 16, 1922.

1,493,864. CAM LEVER ELECTRODE HOLDER; P. L. Orr, Pittsburgh, Pa. App. filed March 30, 1921.

1,493,896. ELECTRIC FURNACE RESISTOR SUPPORT; T. A. Reid, Wilkinsburg, Pa. App. filed Jan. 13, 1922.

1,493,900. ELECTRIC INSTALLATION FIXTURE; I. R. Seltzer, Waterbury, Conn. App. filed June 12, 1919.

1,493,904. LOAD-REGULATOR SYSTEM; S. A. Staege, Pittsburgh, Pa. App. filed Sept. 19, 1919. For preventing peak loads on feeder circuits.

1,493,908. STARTING MECHANISM FOR AUTOMOBILES; J. E. Trostle, Springfield, Mass. App. filed Dec. 16, 1920. Using an electromagnet to move motor pinion.

1,493,968. SYSTEM OF DISTRIBUTION; R. W. Davis, West Allis, Wis. App. filed Nov. 15, 1920. Where the load fluctuates and energy must be stored as in a flywheel.

1,493,988. LAMP SOCKET; T. J. Kerwin, Chicago, Ill. App. filed May 16, 1921.

1,494,008. METHOD OF AND MEANS FOR CONVERTING ENERGY; F. Nagler, Wauwatosa, Wis. App. filed Sept. 5, 1918. Of fluids such as water.

1,494,023. INSULATOR BRACKET; C. A. Rolfe, Redlands, Cal. App. filed March 13, 1920. For mounting insulators on crossarms after they have fallen off their original pin mountings.

1,494,047. DYNAMO-ELECTRIC MACHINE CONSTRUCTION; R. B. Williamson, Milwaukee, Wis. App. filed Dec. 17, 1921. With special arrangement of core and windings to provide increased ventilation and facilitate removal of the windings.

1,494,058. CLOCK CONTROL FOR TALKING-MACHINE RECORDS; D. Brunelli, Philadelphia, Pa. App. filed Feb. 15, 1923.

1,494,070. CORE FOR ELECTROMAGNETIC APPARATUS; H. R. MacKnight, Bedford, Ohio. App. filed May 26, 1922. Using particles of iron separated by an insulating liquid as oil.

1,494,083. TELAUTOGRAPH; G. S. Tiffany, Summit, N. J. App. filed July 14, 1920. Automatic exchange for telautograph systems.

1,494,117. LIGHTING FIXTURE; W. R. Kahns, Brooklyn, N. Y. App. filed July 29, 1922.

1,494,121. AMMETER BRACKET; J. Lake, Jr., Brooklyn, N. Y. App. filed April 24, 1923.

1,494,130. PROCESS OF AND MATERIAL FOR THE PRODUCTION OF CARBIDE AND REDUCTION OF ORE; J. H. Reid, Readsboro, Vt. App. filed Jan. 27, 1921.

1,494,152. CONTINUOUS AUTOMATIC PROCESS FOR THE PRODUCTION OF METAL SHEETS, WIRE, TUBES, CYLINDERS AND OTHER ARTICLES; S. O. Cowper-Coles, Sunbury-on-Thames, England. App. filed Oct. 2, 1922.

1,494,159. ALARM DEVICE SPECIALLY ADAPTED AS FIRE SIGNAL; J. Düggelin, Siebnen, Switzerland. App. filed May 5, 1922.

1,494,173. AUTOMATIC TELEPHONE SYSTEM; G. H. Kuhl, Chicago, Ill. App. filed May 8, 1919. Non-numerical line switch of the rotary type for use in such a system.

1,494,176. CARBURETOR VALVE; C. C. Little, San Jose, Cal. App. filed March 3, 1919.

1,494,189. MOTOR-REGULATING DEVICE; P. Russel, Swarthmore, and E. B. Wilford, Merion, Pa. App. filed July 19, 1923. To maintain constant speed at all loads.

1,494,202. POT-HEAD DEVICE; P. F. Williams, Chicago, Ill. App. filed Feb. 1, 1918.

1,494,207. APPARATUS FOR HEATING WATER ELECTRICALLY; C. O. Bastian, London, England. App. filed Aug. 16, 1920. Supply maintained at constant temperature below boiling point.

1,494,230. MOTOR CONTROLLER; H. N. Fochs, New York, N. Y. App. filed Oct. 23, 1922.

1,494,232. TESTING OUTFIT AND TOOL CASE; P. Friedly, Convoy, Ohio. App. filed Oct. 8, 1921. For automobiles.

1,494,239. APPARATUS FOR ARC WELDING AND HARD-SOLDERING SAW BLADES AND THE LIKE; K. Hauser, Stuttgart, Germany. App. filed Jan. 2, 1923.

1,494,272. ARC LAMP CONTROL SYSTEM; L. E. Miller, Alliance, Ohio. App. filed Nov. 20, 1919.

1,494,293. ELECTRICAL APPARATUS; I. H. Sclater, Pittsfield, Mass. App. filed Feb. 15, 1921. Using bushings, as in a transformer. Bushing arranged to be readily securable or removable.

1,494,311. ELECTRIC SIGNAL; E. P. Kelly, L. L. Champlin and F. Ario, Mankato, Minn. App. filed Feb. 18, 1922. Of the warning type.

(Issued May 20, 1924)

15,843 (reissue). DIRECT-CURRENT MOTOR AND GENERATOR; G. Stirk and J. G. Stirk, Halifax, England. App. filed Sept. 18, 1920. Systems of motor control as employed with vehicles, rolling mills, etc.

1,494,326. CONTINUOUS-FLOW WATER HEATER; L. M. Adams, Seattle, Wash. App. filed March 3, 1923.

1,494,330. CONDENSER TESTER; H. Austin, Washington, D. C. App. filed Oct. 29, 1921. For automobile ignition condensers.

1,494,332. LINE AND GROUND WIRE CONNECTOR; A. Baker, Breckenridge, Mo. App. filed Feb. 19, 1923. Telephone ground-wire connection.

1,494,334. LIGHTNING ARRESTER; A. E. Beattie, Manzanillo, Cuba. App. filed Aug. 14, 1923. For telephone or telegraph line.

1,494,347. HIGH-SPEED RADIO SYSTEM; L. Espenschied, Queens, N. Y. App. filed April 30, 1920. Using carrier currents.